NIH Toolbox® for Assessment of Neurological and Behavioral Function

Administrator's Manual

iPad App Version 1.1

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A. Introduction to the NIH Toolbox App

A.1 What is the NIH Toolbox App?

The NIH Toolbox app provides access to the NIH Toolbox for Assessment of Neurological and Behavioral Function, a standard set of valid, reliable and royalty-free tools for assessing cognitive, emotional, motor and sensory function. Designed to benefit all scientists interested in investigating behavioral and neurological function, the NIH Toolbox App is also relevant for students and clinicians across a broad spectrum of health research. It is particularly well-suited for measuring outcomes in longitudinal epidemiological studies along with prevention or intervention trials. NIH Toolbox measures have been normed and validated across the lifespan in participants ages 3-85.

A.2 Development of the NIH Toolbox

In 2004, 15 Institutes, Centers and Offices at the National Institutes of Health (NIH) that support neuroscience research formed a coalition called the *Blueprint for Neuroscience Research*. The NIH Blueprint goal was to develop new instruments, resources and training opportunities to accelerate the pace of discovery in neuroscience research. Because the research community had long sought the development of standard instruments to measure cognitive and emotional health, in 2006 the NIH Blueprint awarded a contract to develop an innovative approach to meet this need.

The NIH Toolbox was intended to include the following domains: Cognition, Emotion, Motor, and Sensation. Initial literature and database reviews and a 'Request for Information' of NIH-funded researchers identified the sub-domains for inclusion in the NIH Toolbox along with the criteria affecting instrument selection, creation and norming.

NIH Toolbox validation studies were conducted across the entire age range, typically including 450-500 subjects, and statistically compared NIH Toolbox against existing "gold standard" measures, whenever available. For tests using Item Response Theory (IRT) approaches to scoring, calibration samples generally included several thousand participants, ensuring robust models. In total, data were collected from more than 16,000 subjects as part of field-testing, calibration and validation activities.

The NIH Toolbox project conducted a large national norming study in both English and Spanish languages. A sample of 4,859 participants, ages 3-85, representative of the U.S. population based on gender, race/ethnicity, and socioeconomic status was administered all of the NIH Toolbox measures at sites around the country. NIH Toolbox normative scores are now available for each year of age from 3 through 17, as well as for ages 18-29, 30-39, 40- 49, 50-59, 60-69, 70-79, and 80-85, allowing for targeted, accurate comparisons for any research study participant groups against the U.S. population. In 2012, the web-based version of NIH Toolbox was released to the general public and in 2015, the iPad app version was released.

NIH Toolbox measures utilize several advanced approaches in item development, test construction, and scoring. Two of these are Item Response Theory (IRT) and Computer Adaptive Testing (CAT), which are used in a subset of instruments. IRT allows tests to be brief,

yet precise and valid. Using IRT methodology, sets of items are calibrated along a continuum that covers the full range of the construct to be measured. This calibrated set of items enables the creation of CAT, a specialized type of computer-based testing that enables administration of items based on individuals' responses, with minimal burden on participants and precise evaluation at the individual level.

NIH Toolbox instrument development has focused on the continuity of assessments throughout the lifespan. An expert team of early childhood and older adult assessment consultants was engaged to provide guidelines for administration, to offer input on instrument development, and to review all NIH Toolbox measures as they relate to the needs of young children and elderly participants.

A.3 Characteristics of the NIH Toolbox App

The use of the NIH Toolbox has grown significantly since public release of the web-based version in 2012. Beginning in 2015, the NIH Toolbox is available in the form of an iPad app that presents the following user-friendly features and functions:

- Takes advantage of portable, easy-to-use technology
- Presents a complete stand-alone application – internet access is no longer required during test administration
- Administering the tests can be easily mastered with practice
- Minimizes the use of custom hardware
- Features enhanced normative scores for individual Cognition tests and composites
- Allows results to be stored locally on the iPad or in iCloud
- Provides basic reporting on an individual participant level
- Offers email support (help@nihtoolbox.org)

B. Learning about the NIH Toolbox App

Users will find that the NIH Toolbox is a user-friendly and effective resource for assessing functioning over time. This ***NIH Toolbox Administrator's Manual*** and the ***NIH Toolbox eLearning Course*** are designed to be used together when learning how to use the NIH Toolbox app. After reviewing sections A and B of this Manual, an administrator should go through the eLearning course for the NIH Toolbox app. Once an administrator has studied the eLearning course and completed practice sessions, each instrument is easy to administer.

Once training is complete, this manual should be used for review as needed.

When used electronically, this manual includes hyperlinks that, when clicked on or touched, take the user directly to the referenced section.

B.1 NIH Toolbox App Structure

Introduction – Domain, Battery, Instrument

To better understand the NIH Toolbox structure and to make informed choices as an administrator, there are a number of terms that the user needs to understand.

Domain - The NIH Toolbox spans four domains or broad areas of health and function: Cognition, Emotion, Motor and Sensation. Each domain includes multiple instruments that can be selected individually or used as part of a preset battery.

Preset Battery – A pre-defined set of instruments intended to be administered together in a specific order. The order of instruments within a preset battery cannot be changed. Individual instruments, or additional batteries, can be added to an assessment, before or after the preset battery. Scores are produced for each instrument in the battery as well as composites for the Cognition Battery.

Instrument - A set of items administered in a predetermined fashion that cannot be changed by the administrator. Each instrument is an individual assessment resource that can be administered as a stand-alone measure, as part of a preset battery, or as part of a custom battery. Instruments are also referred to as "measures" and "tests" in this manual. All of these words are used interchangeably.

Item – A question or task within an instrument. The instrument is comprised of items.

Custom Battery – A user-created and named battery containing one or more instruments in any desired order. A custom battery may be created by saving a custom list of instruments for use in future assessments. Once a custom battery has been administered to a participant, it cannot be modified. If a user wishes to edit the custom battery, it must be saved under a new, unique name.

NOTE Custom batteries are only available on the iPad on which it was created. Future releases may enable a custom battery that can be shared across iPads with the same Apple ID. An

administrator can create a custom battery that contains instruments from more than one domain, and the battery can be given in any order specified by that administrator.

Assessment - A group of instruments given to a participant. These may or may not contain a custom or preset battery.

B.2 Getting the NIH Toolbox App

B.2.1 Hardware and Software Needed to Use the NIH Toolbox App

To get the NIH Toolbox App, you will need the following: an **iPad** and an **Apple ID**. These are described in more detail below. The NIH Toolbox App is only available through the "App Store," a digital distribution platform for mobile apps on Apple devices. At this time, only an iPad version of the app has been developed.

iPad

You will need an iPad Air or iPad Air 2 with Wi-Fi capacity that is running iOS version 8.4 or version 9.0. The NIH Toolbox App is not yet compatible with the iPad mini, iPad Pro or other Apple devices (e.g., iPhone).

To obtain the latest version of iOS, see *Settings>General>Software Updates* **on your iPad.**

Apple ID

You will need an Apple ID to use the App Store app, which comes pre-installed on your iPad.

An Apple ID is your all-in-one account used to log in to all Apple products. You may already have an Apple ID. If this is the case, you may use this ID or you may want to consider setting up another Apple ID for your NIH Toolbox activity. You can create an Apple ID as described below.

An Apple ID is associated with your billing information (i.e. credit card). While the NIH Toolbox App is free to install, you must purchase a subscription to be able to administer the instruments. More information about pricing options can be found at nihtoolbox.org.

If you have an Apple ID that you can use for your NIH Toolbox activity, you may skip to Downloading and Opening the NIH Toolbox App. Otherwise, the two ways to create an Apple ID are described below.

I. **How to Create an Apple ID on your iPad**

1. From the Home Screen, tap ***Settings*** > *iTunes & App Stores*.
2. If an Apple ID is already signed in, tap the ***Apple ID*** name and then tap ***Sign Out***.
3. Tap ***Create New Apple ID***.
4. Choose the appropriate store by tapping ***Store***, and select the country in which you are located.
5. Tap ***Done*** to confirm your selection, and then tap ***Next***.
6. To proceed, agree to the ***Terms and Conditions and Apple Privacy Policy***. You can opt to have the Terms and Conditions and Privacy Policy emailed to you for easier reading by tapping ***Send by Email***. To do this, enter a valid email address, and then tap ***Send***.

7. Tap the ***Agree*** button on the bottom-right of the page.
8. Tap ***Agree*** again when the confirmation appears.
9. After you've agreed to the terms and conditions, you'll need to enter an email address and password, and choose three security questions, providing answers to each of them. The email address you provide will be your new ***Apple ID***. Enter your email address, and then tap ***Next***.
   You can also enter an optional ***rescue email address***. We recommend that you provide this ***rescue email address***.
10. If you're trying to create an account using an existing Apple ID, like your iCloud email address, you'll receive a prompt telling you that your email address is already an Apple ID. Simply tap ***Continue***, and then tap ***Use Existing Account*** on the following screen.
11. Next, you'll be asked to enter your billing information. To choose a different Credit Card type, tap one of the ***available options***, and then tap ***Done***. You will not be charged until/unless you make a purchase.
12. After you've filled out all of the fields for your billing information, tap ***Next***.
13. You will then see a screen that says "Verify Your Account."
14. Tap ***Done*** and check your email for a verification email from Apple. If you need to set up email on your iPhone, iPad, or iPod touch, learn how to add an email account to your iOS device (you need to be connected to the Internet for this link to work)
15. Open the email, and tap the ***Verify Now*** link enclosed in the email to activate your account.
16. You will then be taken to a secure page to enter your new Apple ID and password.
17. After you've entered your email address and password, tap ***Verify Address***.
18. To modify or change your account information; such as Apple ID, payment information, or billing address, tap your ***account name*** located at the bottom of the page once you have signed in to the iTunes Store. When prompted, tap ***View Account***. You might be asked to enter your account password again for verification.
19. To sign out of your iTunes Store account, simply tap your ***account name*** at the bottom of the page in the App Store or iTunes Store.

II. How to create an Apple ID on your computer (Apple or Windows operating systems)

1. Open iTunes. If you don't have iTunes, you can download it here.
2. From the Store menu, choose Create Apple ID.
3. Click ***Continue***.
4. To proceed, you'll need to ***agree*** to the Terms and Conditions and Apple Privacy Policy. After you've read the terms, click ***the checkbox*** next to *"I have read and agree to these terms and conditions."*
5. Click ***Agree***.
6. Complete the form to create your free Apple ID. The form includes security questions for your protection, and asks for an optional rescue email address (you need to be connected to the Internet for this link to work). We recommend that you provide a rescue email address.
7. After you've filled out the form, click ***Continue***.
8. If you receive a warning that the email address you entered is already associated with an Apple ID, follow these instructions about using an existing Apple ID (you need to be connected to the Internet for this link to work) instead.

9. Provide a valid payment method and billing address. Your account will be charged only when you make a purchase. No purchase is necessary, but Apple does require you to enter a credit card number to set up an Apple ID.
10. Provide the required billing information and click ***Continue***.
11. Next you will need to verify your email address. Check your email for a verification email from Apple.
12. In the verification email you receive from Apple, click the ***Verify Now link***.
13. You will be taken to the Apple ID page to verify your email address.
14. Enter your email address and the password you created when you established your Apple ID.
15. Click ***Verify Address***.

B.2.2 Downloading and Opening the NIH Toolbox App

1. Tap on the ***App Store*** icon on your iPad.
2. Enter NIH Toolbox in the Search field in the upper right corner of the App Store and tap ***Search***.
3. Once the NIH Toolbox app is displayed, tap the ***Get*** button next to it. It will turn into an INSTALL button.
4. Tap ***Install*** to confirm you wish to download and install the app. If you are already signed in using your Apple ID, a pop up screen will ask you to provide your password. If you are not signed in, you will be given the options of "Use Existing Apple ID," "Create New Apple ID" and "Cancel."
5. Since you have already created your Apple ID, tap the ***Use Existing Apple ID*** button and sign in using your Apple ID and password. At this point, the download will begin and the NIH Toolbox app will become available on your iPad.
6. If you cannot see the app on your iPad after downloading, try swiping to the right or left to see all of the apps installed on your iPad.
7. Open the NIH Toolbox App by tapping the NIH Toolbox icon.
8. Accept the NIH Toolbox app Terms and Conditions (see Appendix 1).
9. When opening the app for the first time, you will be asked to set up a passcode. You will be asked to enter this passcode every time you open the app in the future. Keep this passcode in a safe place.

NOTE The NIH Toolbox app is available through the app store and can be downloaded for free. However, to use the instruments, you will be asked to purchase a 6-month subscription for $9.99 (special introductory pricing). This subscription may be used on any iPad on which you install the NIH Toolbox app, as long as you enter the same Apple ID used for purchase. After your 6-month subscription expires, we will offer a 12-month subscription for purchase at regular pricing ($100-$200 range), if you choose to continue administering the instruments. After expiration, you will still have access to your data on the iPad, but you will no longer be able to create new participants/patients or collect new data.

B.3 NIH Toolbox Support

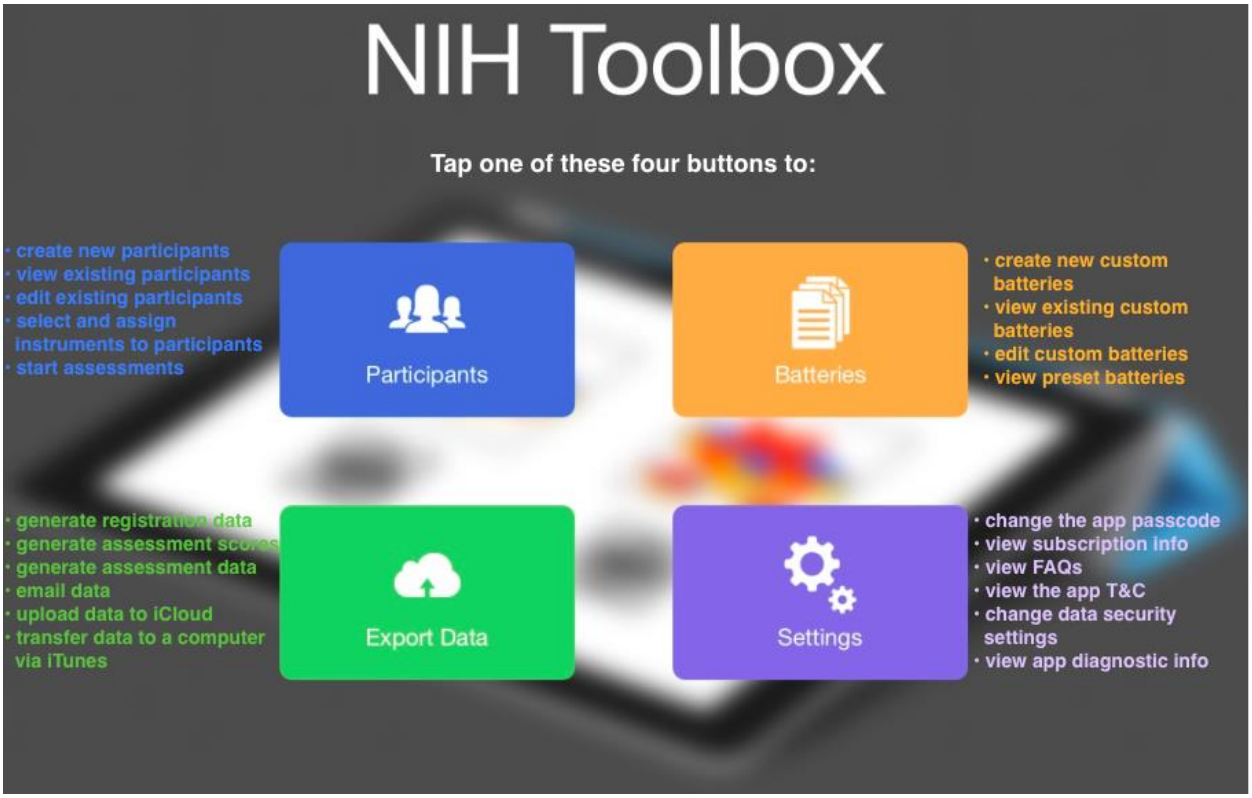
To access a copy of this manual or view more resources about the NIH Toolbox, please visit www.nihtoolbox.org/Resources/NIHToolboxiPadapp.

Contact help@nihtoolbox.org with questions, or to report technical problems.

The NIH Toolbox is more than a set of measures: we are a community of users, and NIH Toolbox continues to evolve. Help us make this product the best it can be. *If you have suggestions for changes or corrections, please share them here: info@nihtoolbox.org.*

B.4 Using the NIH Toolbox App

B.4.1 NIH Toolbox App at a Glance


NIH Toolbox
Tap one of these four buttons to:
• create new participants
• view existing participants
• edit existing participants
• select and assign instruments to participants
• start assessments
Participants
Batteries
• create new custom batteries
• view existing custom batteries
• edit custom batteries
• view preset batteries
• generate registration data
• generate assessment scores
• generate assessment data
• email data
• upload data to iCloud
• transfer data to a computer via iTunes
Export Data
Settings
• change the app passcode
• view subscription info
• view FAQs
• view the app T&C
• change data security settings
• view app diagnostic info

Once the app is launched, users will see 4 buttons on the home screen: Participants, Batteries, Export Data and Settings. This section of the manual is organized according to the functions achieved by tapping one of those buttons. Data security is described at the end of the section.

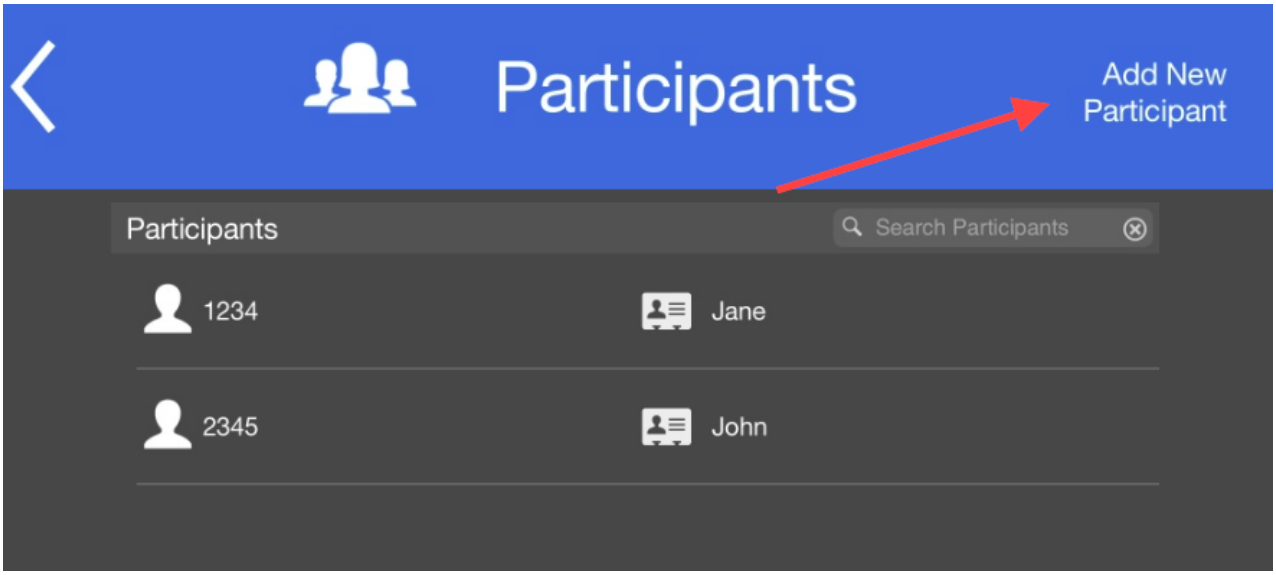
NOTE Required setting: A passcode must be set on the iPad running the NIH Toolbox app, for security purposes. The app will not launch if a passcode is not set.

NOTE Recommended setting: Disable all pop-up messages (i.e. calendar alerts) on the iPad running the NIH Toolbox app. This will ensure smooth, uninterrupted data collection.

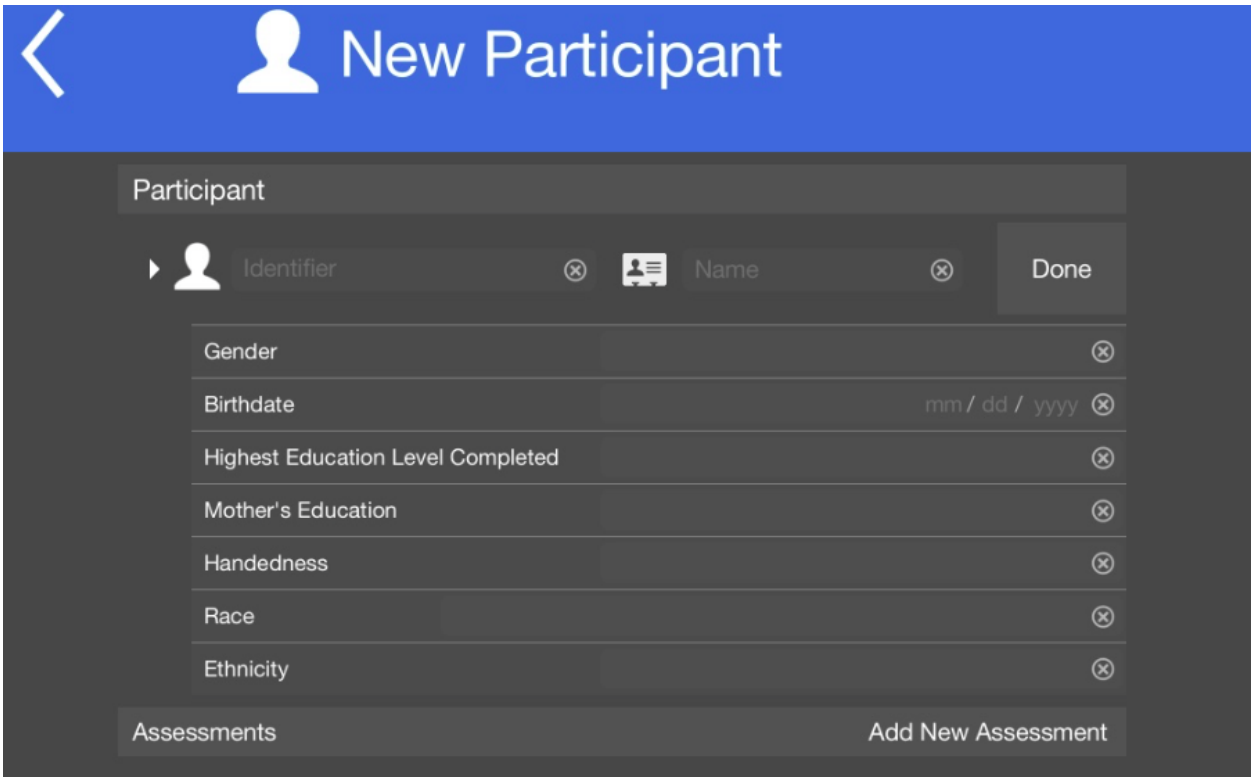
B.4.2 Participants

Create a new participant

Step 1: Tap ***Add New Participant*** in the upper right corner of the Participant screen:



Step 2: Complete the new participant information:



- Identifier – any alphanumeric combination or special symbols you wish to assign to this participant. This is the only field that is ALWAYS required.
- Name – the participant's name. This is the only field that is ALWAYS optional regardless of the function you wish to use.
- Gender
- Birthdate
- Highest Education Level Completed
- Mother's Education
- Handedness (required); If unknown, please refer to Appendix 2 for a brief survey to determine handedness
- Race
- Ethnicity

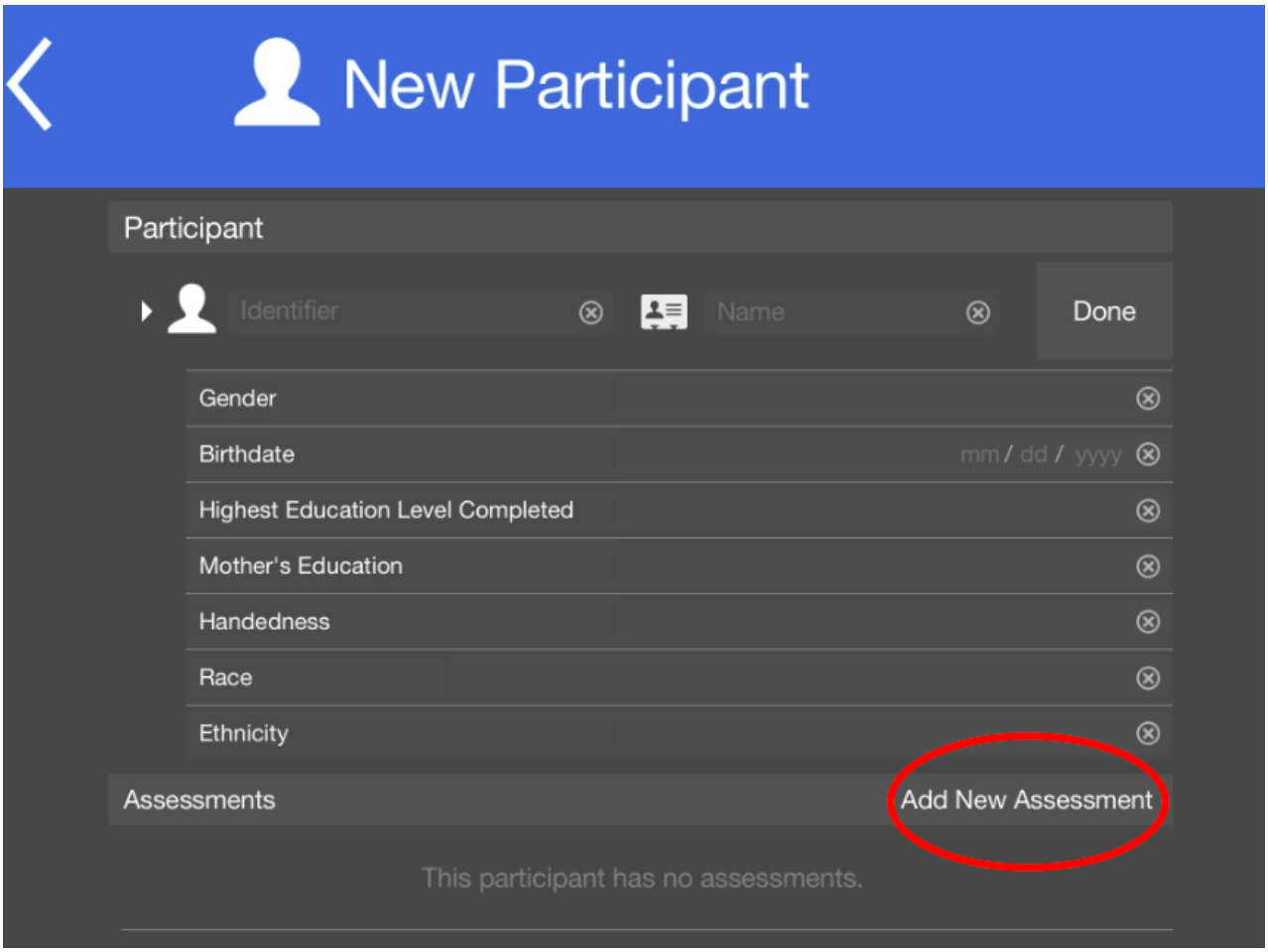
Please note that some of these fields may be required for some instruments. Examiners will be alerted when launching an assessment if one or more required fields are missing based on the selection of instruments. Error and Warning messages are described below in more detail.

If a participant is less than 18 years old and his/her Mother's Education is unknown, examiners will be asked to complete additional fields related to other family members' education.

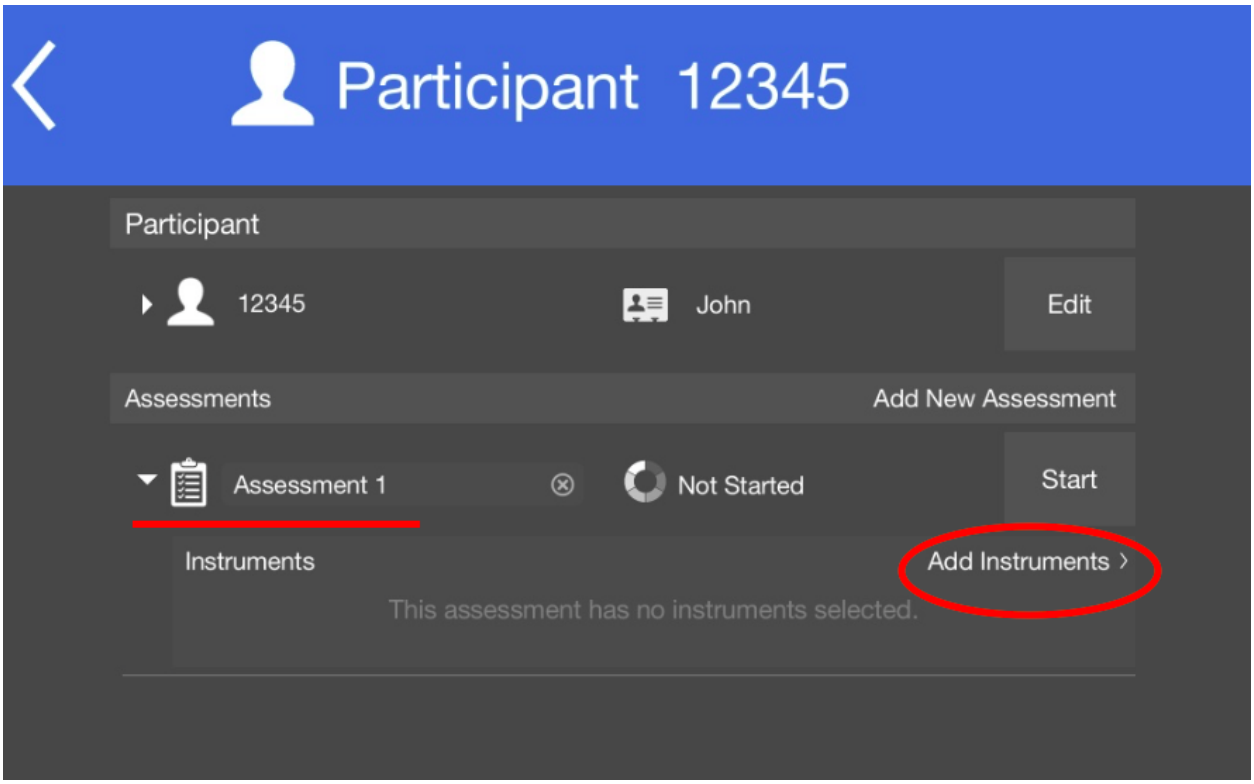
If the NIH Toolbox Picture Vocabulary Test or the NIH Toolbox Oral Reading Test is selected, examiners will also see a Starting Education Level Override field. If an examiner feels that a participant should begin the test at a level higher or lower than what would be appropriate for his/her grade/education level, the examiner should use this feature. Using the override will affect the difficulty of the initial items presented on these tests; this may be appropriate in cases where the participant is expected to be at a significantly higher or lower functioning level than would be expected by his/her grade level/education. This function should be used judiciously and only in cases where the examiner has prior evidence of lower or higher participant functioning.

Assign batteries or instruments to a participant

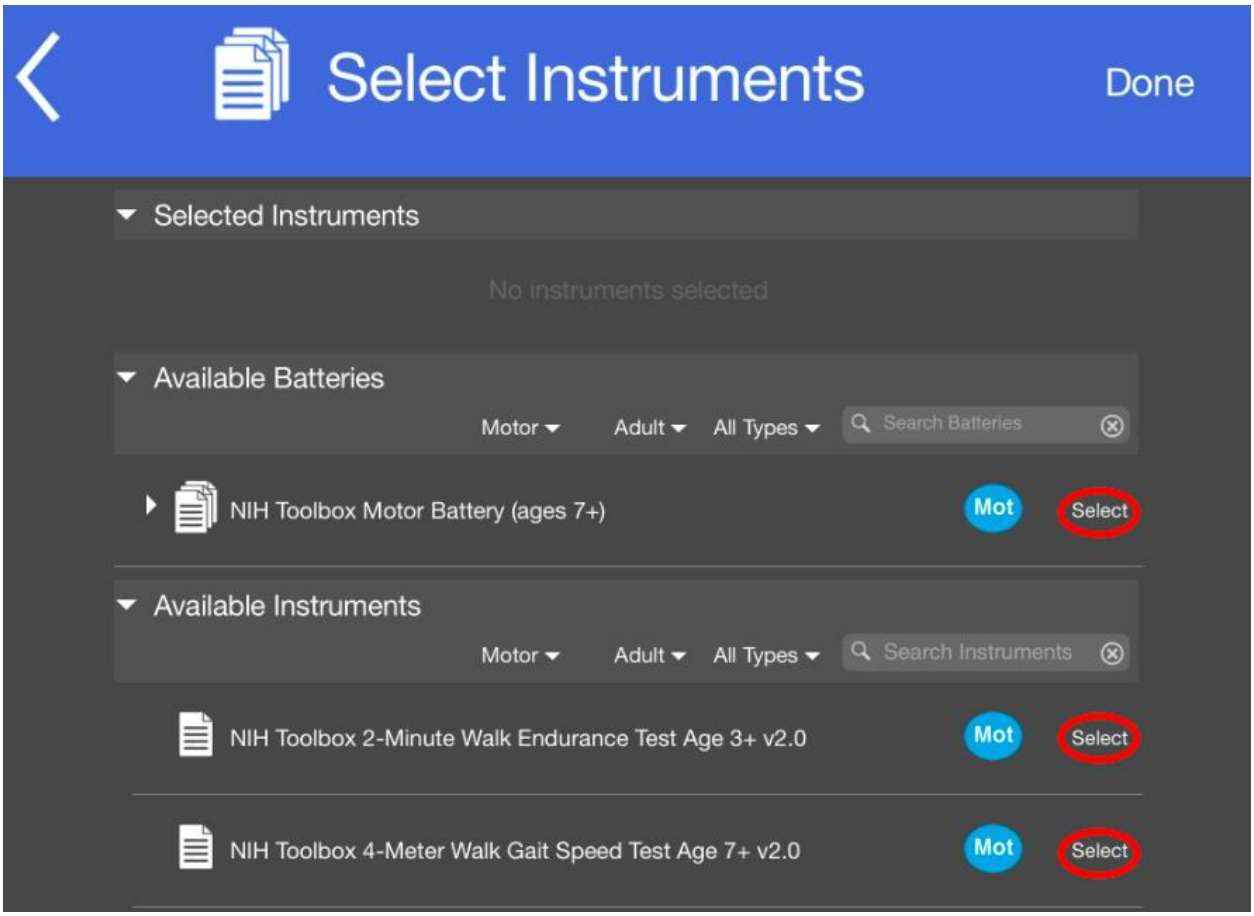
Step 1: Tap ***Add New Assessment*** either from a new participant or an existing participant window:



Once Add New Assessment is tapped, the app will create a new assessment and offer the user an opportunity to add instruments to that assessment (***Add Instruments*** button). The name of the assessment defaults to “Assessment X,” where X is a numeral, starting at 1 and moving up sequentially, depending on how many assessments have been assigned to this participant. Tap the name of the assessment to edit it.



Step 2: Select batteries or individual instruments to be added to the assessment from the list of Available Batteries or the list of Available Instruments by tapping Select next to the instrument's or battery's name.



Users can **filter** the list of available batteries, as well as the list of available instruments by tapping arrows and making selections from the following categories:

All Domains

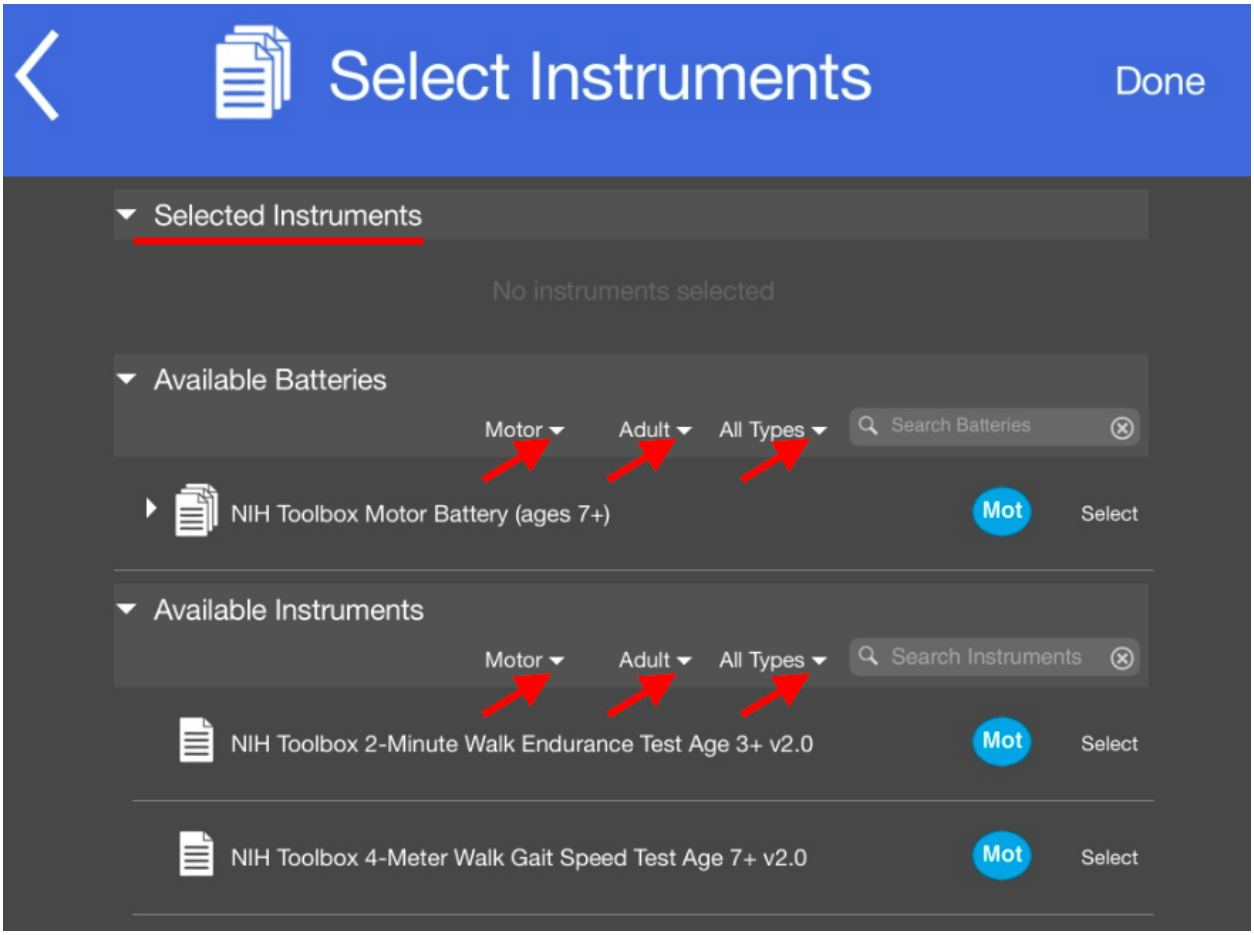
- Cognition
- Emotion
- Motor
- Sensation

All Ages

- Ages listed individually from 3-17
- Adult

All Types

- CAT
- FF (Fixed Form, for select NIH Toolbox Emotion instruments)



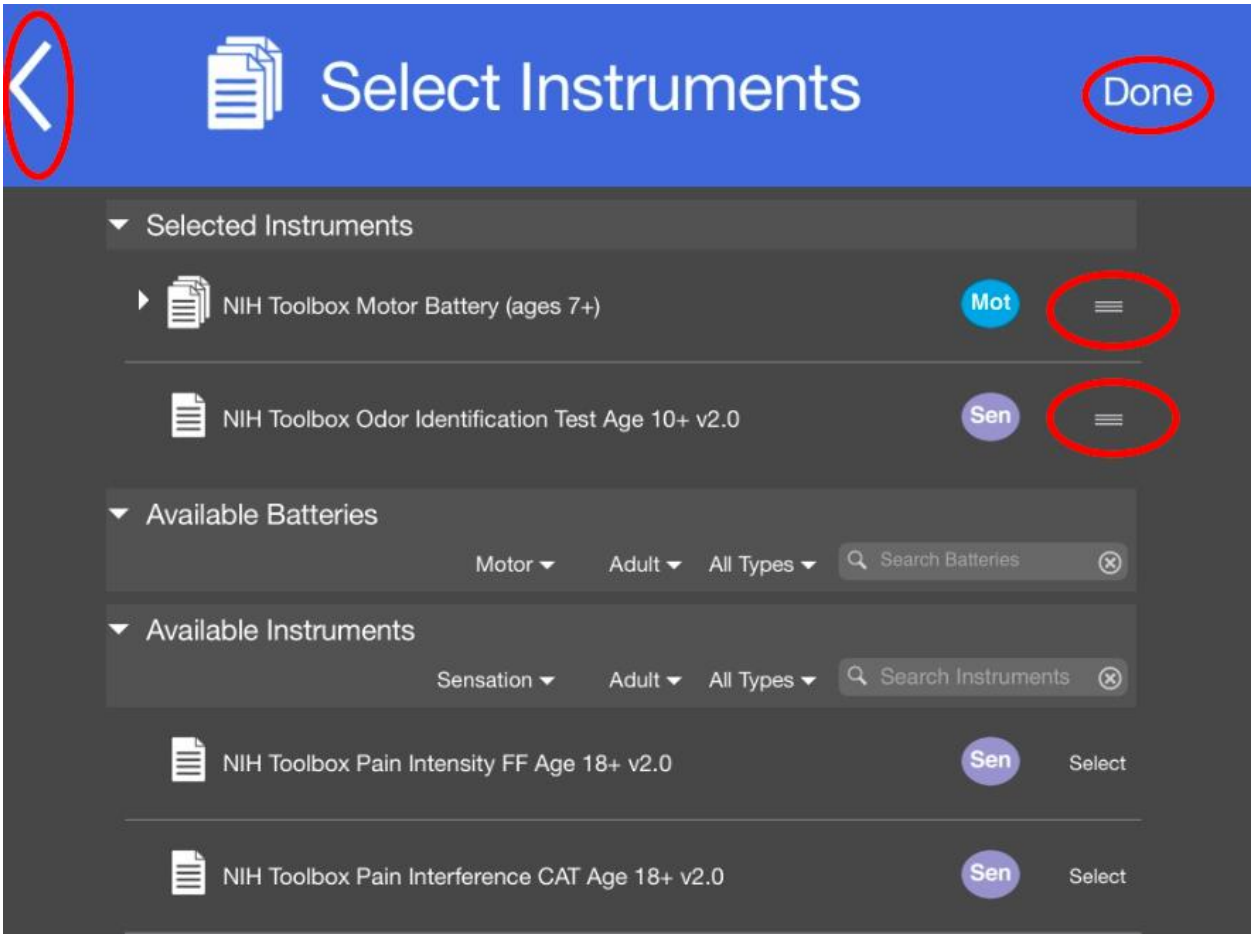
Selected instruments will move to the upper part of the screen and will be listed under Selected Instruments.

NOTE **NIH Toolbox Touch Screen Tutorial Age 3+** is available and recommended for anyone not familiar with using an iPad or similar devices. It should be added as the very first instrument in the assessment.

NOTE **NIH Toolbox Emotion Instructions (Adult/Child)** should be added immediately before the first NIH Toolbox Emotion instrument for the given participant. Preset batteries do include appropriate instructions, so instructions should only be added if the user is ***not*** selecting a preset emotion (adult/child) battery. **NIH Toolbox Emotion Instructions (Parent Report)** should be added immediately before the first NIH Toolbox Emotion instrument to be completed by parents about the given child. Preset batteries do include appropriate instructions, so instructions should only be added if the user is ***not*** selecting a preset emotion (parent report) battery. **NIH Toolbox Emotion Instructions** should also be used with NIH Toolbox Pain instruments.

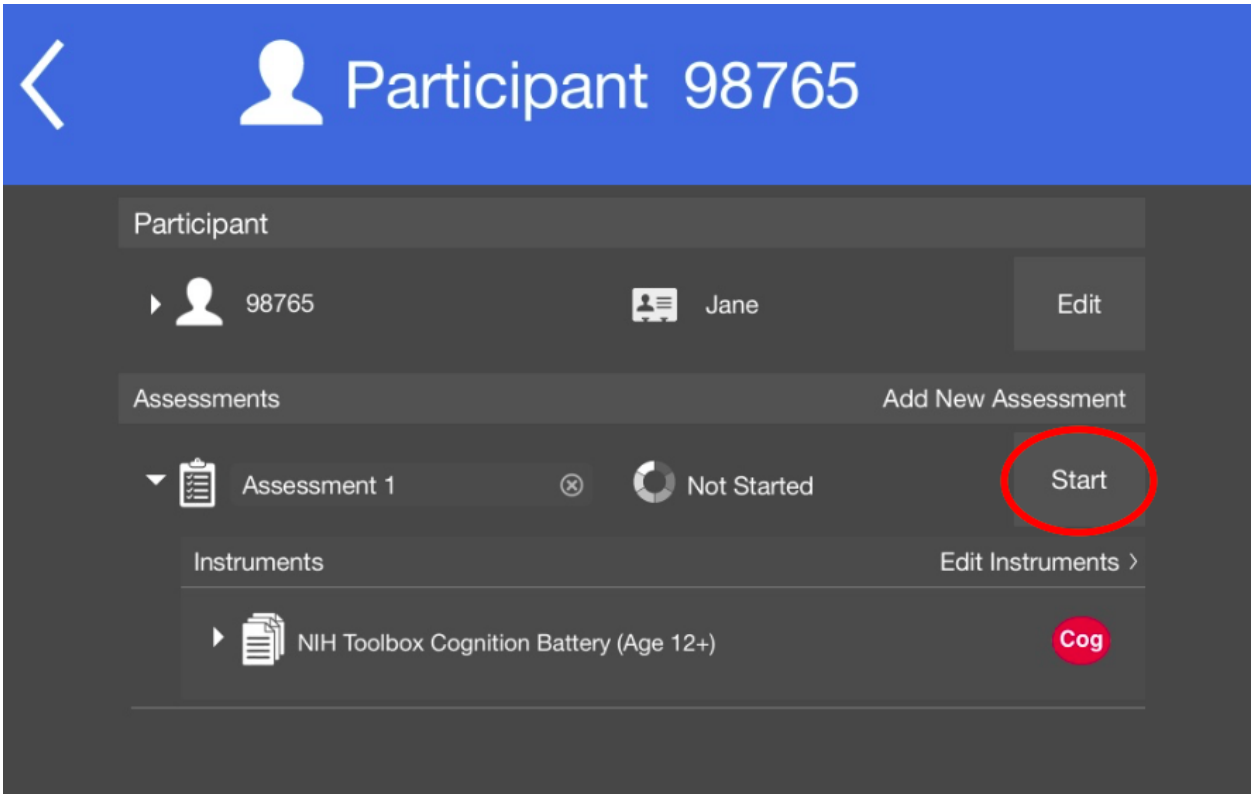
Step 3: **Reorder** selected instruments, if desired, by dragging them up or down, using the ☰ symbol to the right of the instrument name.

Tap ***Done*** in the upper right corner of the screen or tap the arrow in the upper left corner to save your selections and to return to the previous screen.

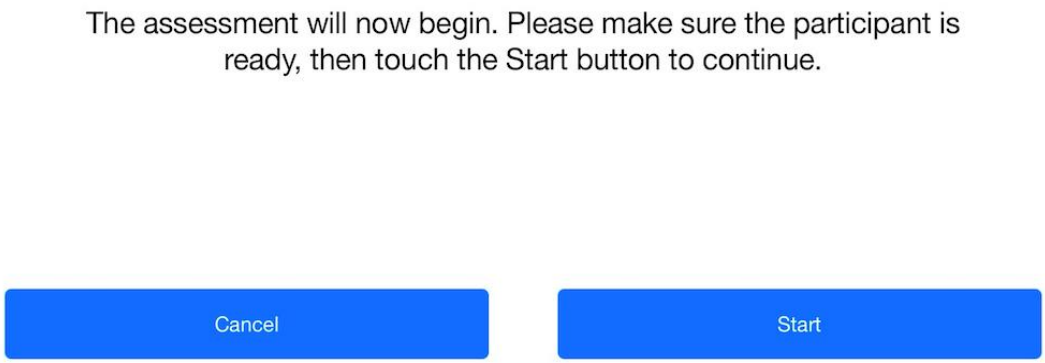


Start an Assessment

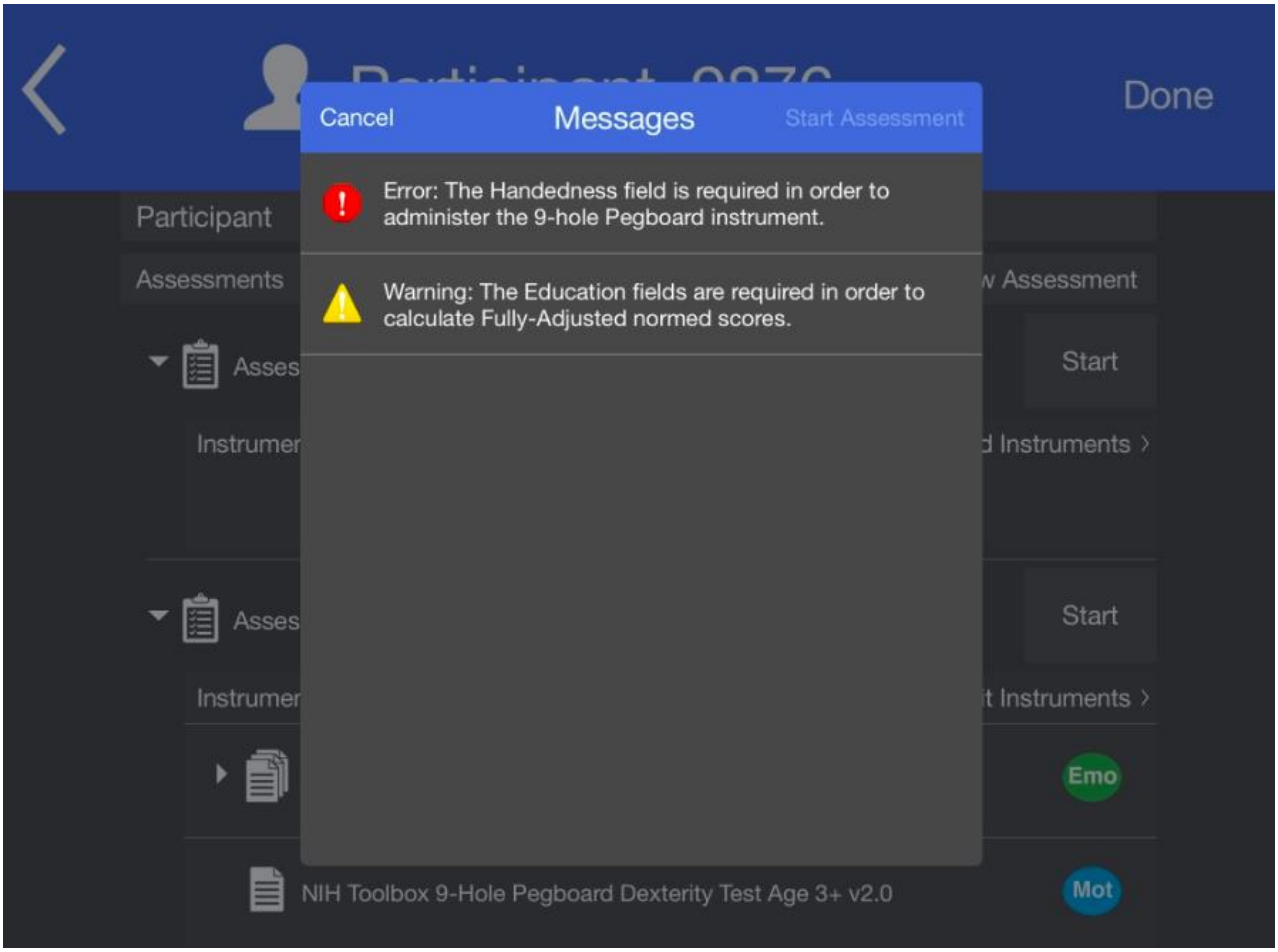
Upon completing instrument selection, tap ***Start*** to launch the assessment.



At this time, users will be presented either with the assessment launch screen:


The assessment will now begin. Please make sure the participant is ready, then touch the Start button to continue.
Cancel
Start

or with one or more Error or Warning messages alerting users about problems with their assessment.



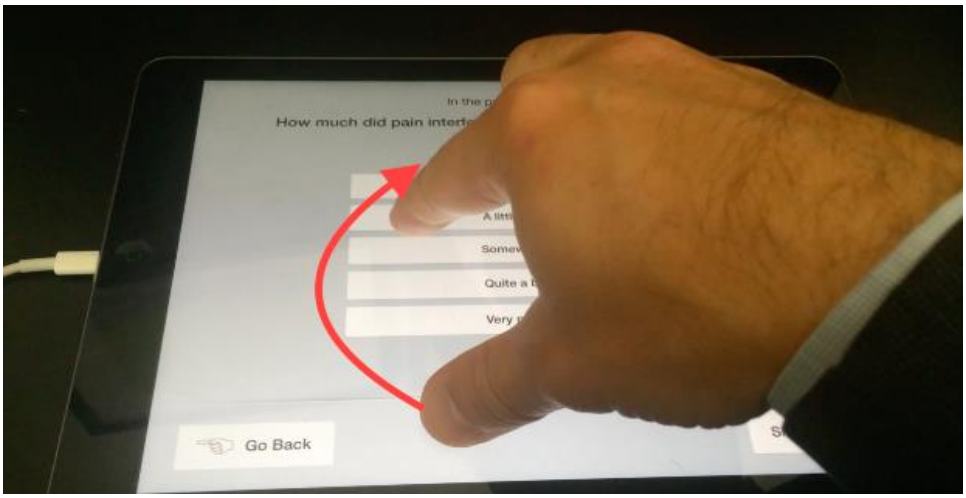
Error messages inform users about problems that prevent them from launching the assessment. Users need to go back to the New Assessment screen (via Participants) and fix those problems before the assessment can be started.

Warning messages inform users about missing information or characteristics of the assessment that users may want to revise before starting. It is possible either to go back to the New Assessment screen and change them or to launch the assessment without making changes.

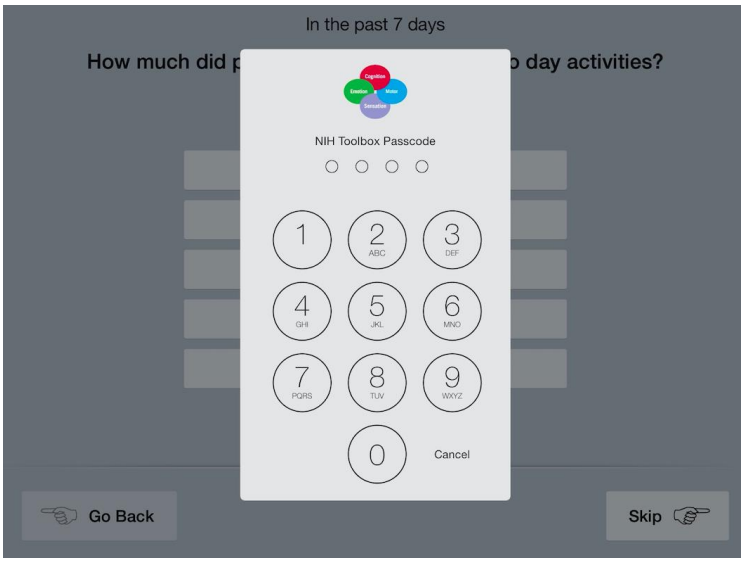
Pause, Skip, Stop

An assessment can be paused at any time after launch.

Step 1: Put two fingers on the screen and rotate one of them clockwise as if making a half-circle on the screen.



Step 2: Enter the administrator's passcode that was set up when the app was first launched.



Step 3: Select from the 3 options presented on the screen:

- Resume Instrument
- Skip Instrument
- Stop Assessment

Different instruments may behave differently if "Resume Instrument" or "Stop Assessment" is selected. In most cases, users will be taken back to where they were before pausing the assessment. In some cases (e.g., timed tests), users will be taken back to the beginning of the instrument. In select cases, an instrument may not be restarted once paused. Detailed rules for each test are available in Appendix 3.

If "Skip Instrument" is selected, users will be asked the reason for skipping:

- Safety Exclusion
- Participant/Respondent Refused
- No Time
- Physical Limitations
- Communication Problems
- Language Barrier
- Equipment Failure
- Ineligible
- Participant Ill/Emergency
- Target Respondent Unavailable
- Other

Once the reason that best describes why the instrument was skipped is selected, users will be taken to the beginning of the next instrument, or the end of the assessment, if this was the last instrument in their assessment. If "Other" is selected, users will be taken to a text screen where they will be required to enter another reason and then allowed to skip the instrument.

If "Stop Assessment" is selected, users will be asked the reason for stopping:

- Safety Exclusion
- Participant/Respondent Refused
- No Time
- Physical Limitations
- Communication Problems
- Language Barrier
- Equipment Failure
- Ineligible
- Participant Ill/Emergency
- Target Respondent Unavailable
- Other

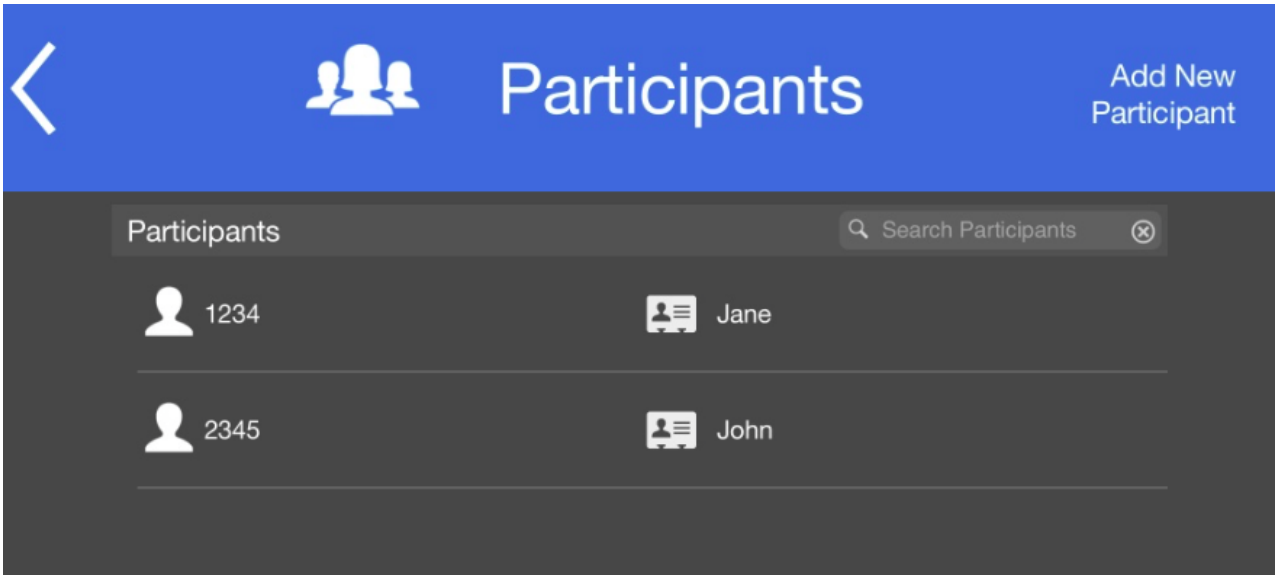
Select the reason that best describes why the assessment is being stopped and proceed to the main screen of the app. If "Other" is selected, users will be taken to a text screen where they will be required to enter another reason and then allowed to stop the assessment.

If an instrument is paused, skipped, or stopped, this information is recorded in the data export along with the reason indicated.

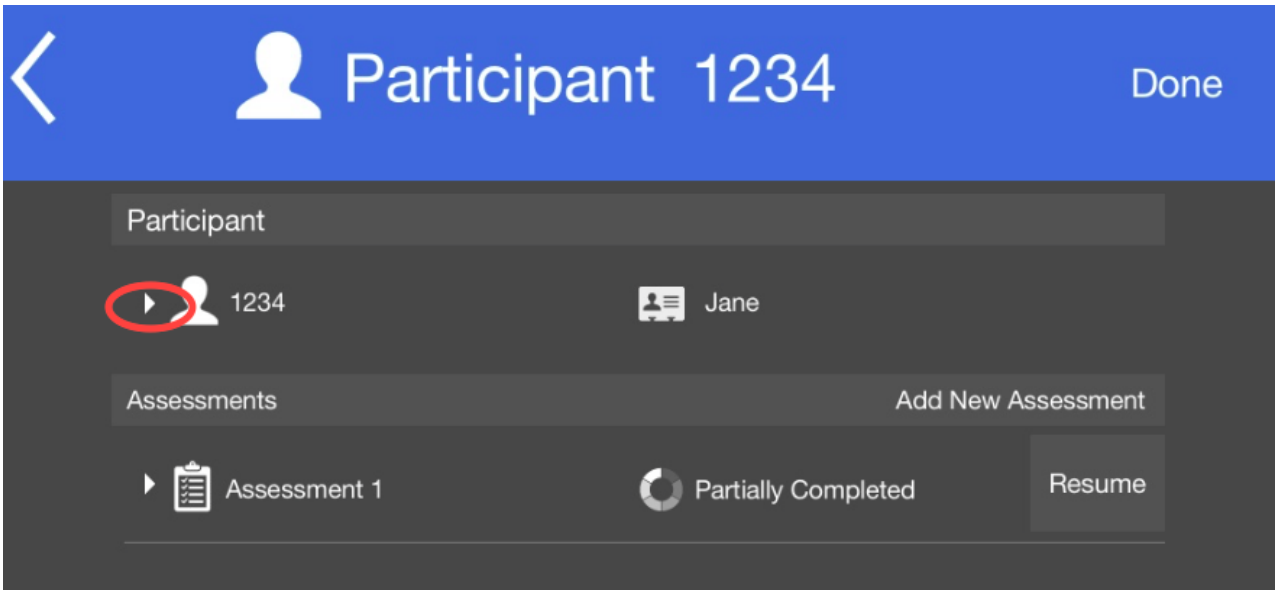
Stopped assessments can generally be resumed, but there are exceptions for specific instruments, as for pausing. Detailed rules for each test are available in Appendix 3.

View Existing Participants

If the participant was previously created using the NIH Toolbox app on this iPad, you may also locate him/her by tapping Search Participants at the top right corner of the black part of the screen.



Once the participant is located, tap their ***Identifier*** or ***Name*** to open their record.

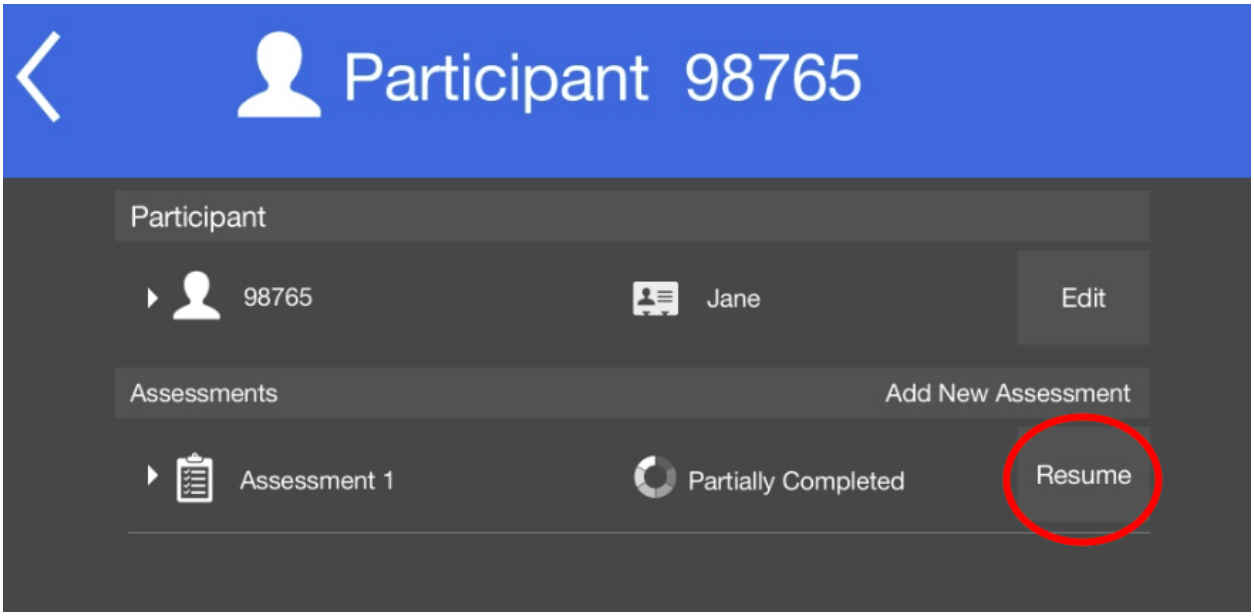


Tap the arrow to the left of the Identifier to view/edit participant's information. Please note, if you edit participant information, this change will not be indicated in the data export. If you must change participant information after data for that participant has already been collected, it is highly recommended that you either a) create a new participant with a unique Identifier (i.e., different than the Identifier used for the first assessment), or b) record the change with the date in another record-keeping system (i.e., lab notebook, subject tracking software, medical record, etc.).

Once all the information is complete, return to the previous screen by tapping the arrow at the screen's top left.

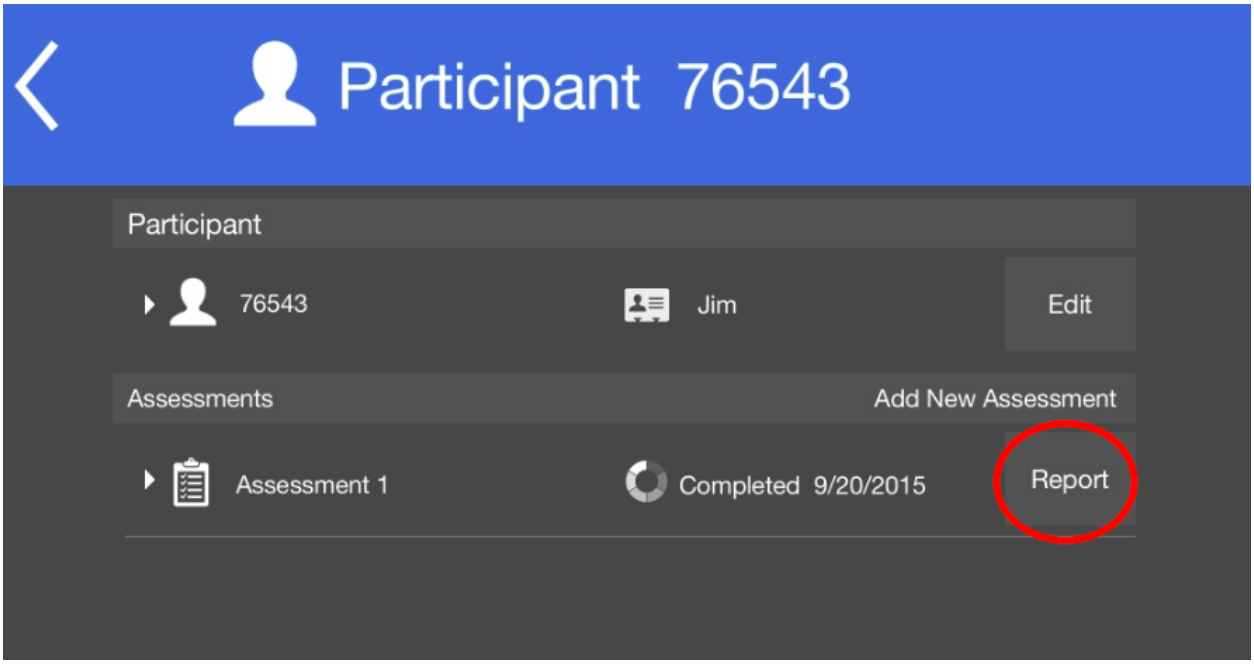
Resume an Assessment

All partially completed and not started (no items administered) assessments may be resumed (though individual instruments within them may have varying rules – see Appendix 3).

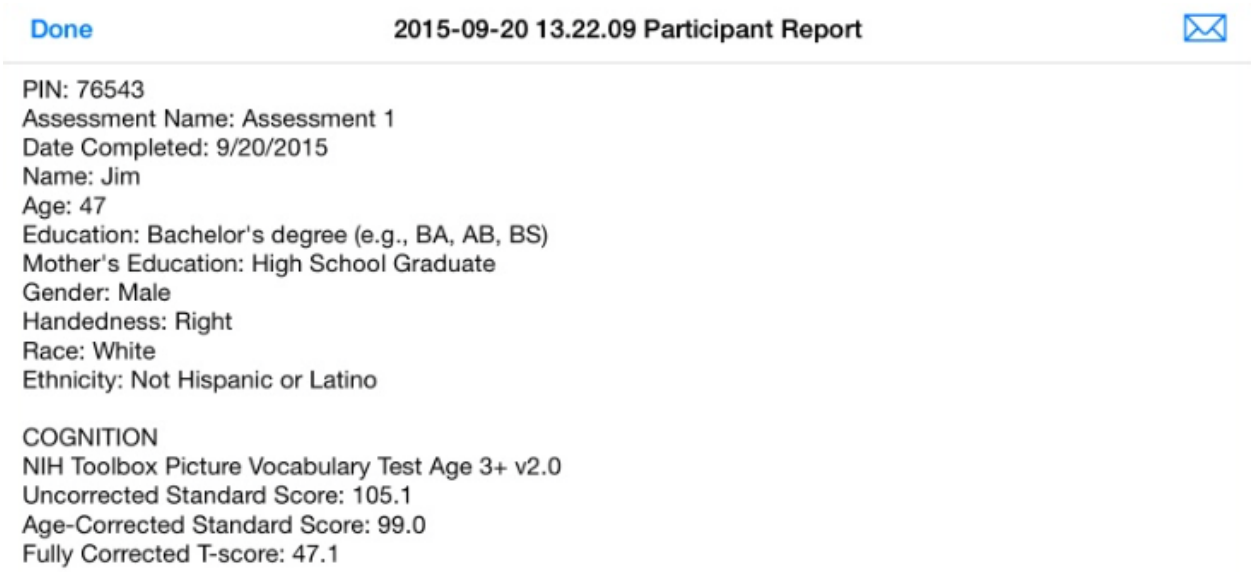


Generate a report

Once an assessment is completed, a simple report can be generated by tapping ***Report***. Reports contain demographic information and scores for any tests that were given during that specific assessment.



A sample of the report can be seen below:

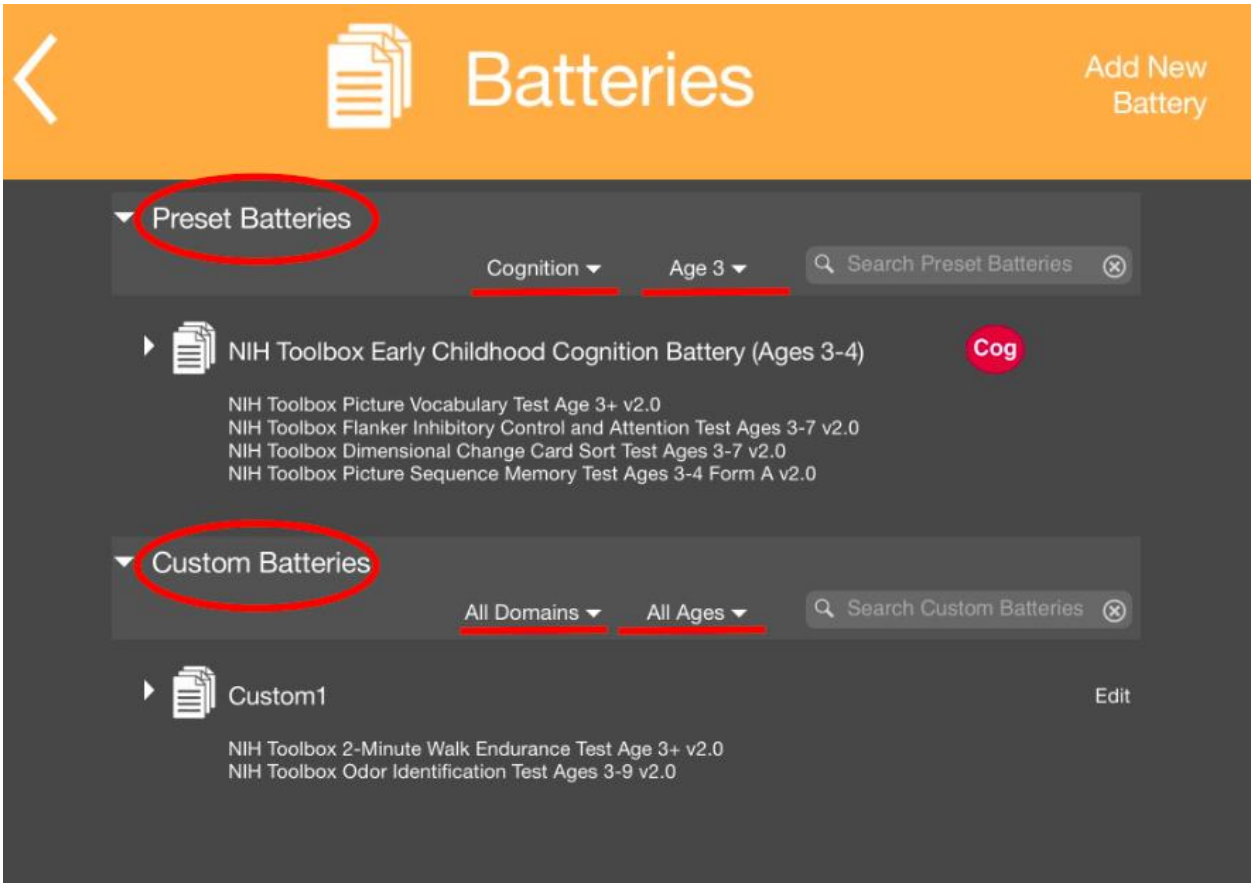


B.4.3 Batteries

View Existing Batteries (Preset and Custom)

This is a quick way to view all the batteries available on this iPad and the instruments that comprise each.

Step 1: Tap the ***Batteries*** button.


Batteries
Add New Battery
Preset Batteries
Cognition
Age 3
Search Preset Batteries
NIH Toolbox Early Childhood Cognition Battery (Ages 3-4)
Cog
NIH Toolbox Picture Vocabulary Test Age 3+ v2.0
NIH Toolbox Flanker Inhibitory Control and Attention Test Ages 3-7 v2.0
NIH Toolbox Dimensional Change Card Sort Test Ages 3-7 v2.0
NIH Toolbox Picture Sequence Memory Test Ages 3-4 Form A v2.0
Custom Batteries
All Domains
All Ages
Search Custom Batteries
Custom1
Edit
NIH Toolbox 2-Minute Walk Endurance Test Age 3+ v2.0
NIH Toolbox Odor Identification Test Ages 3-9 v2.0

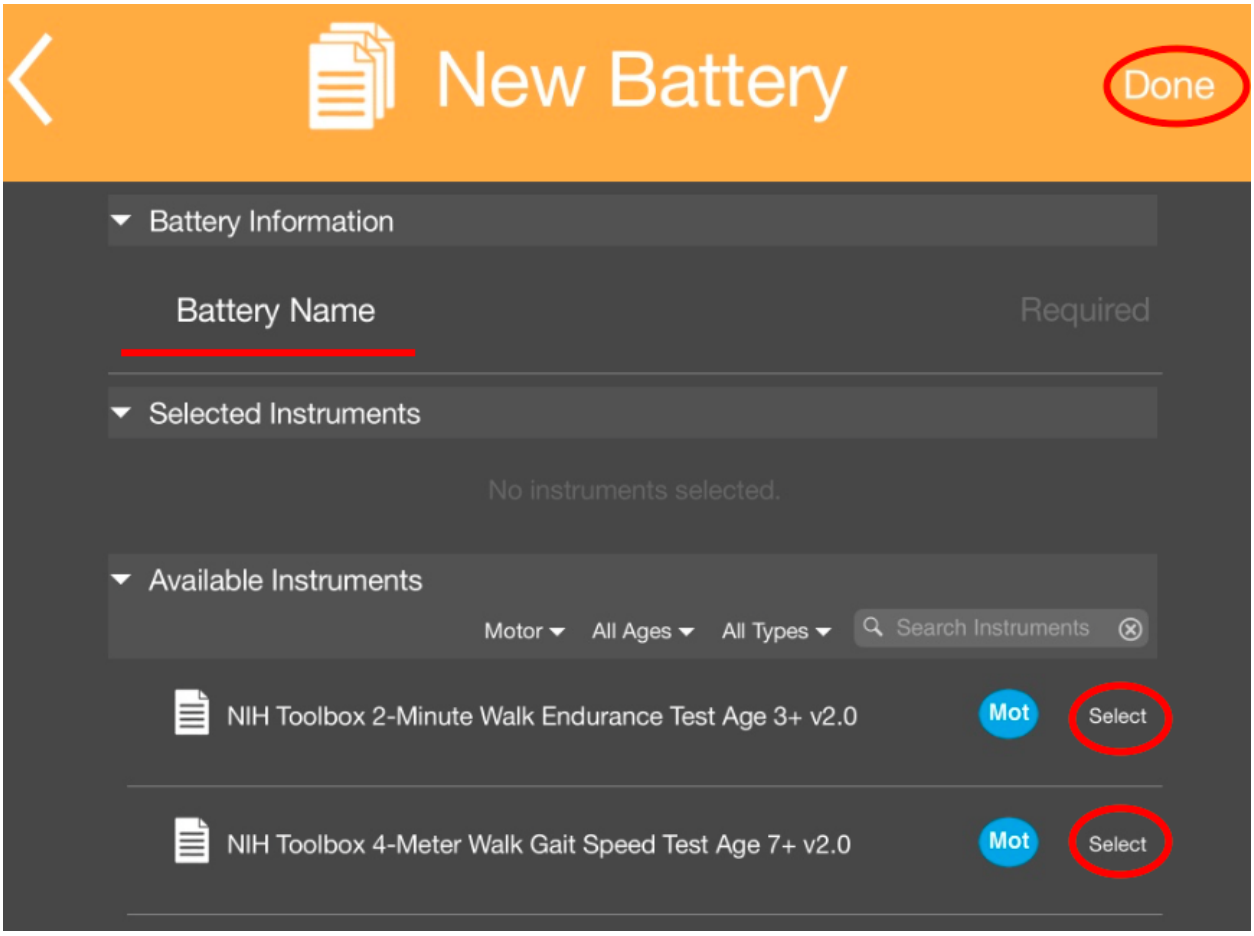
You can filter which batteries you want displayed.

If no custom battery has ever been created on this iPad, the Custom Batteries list will be empty.

Create a New Custom Battery

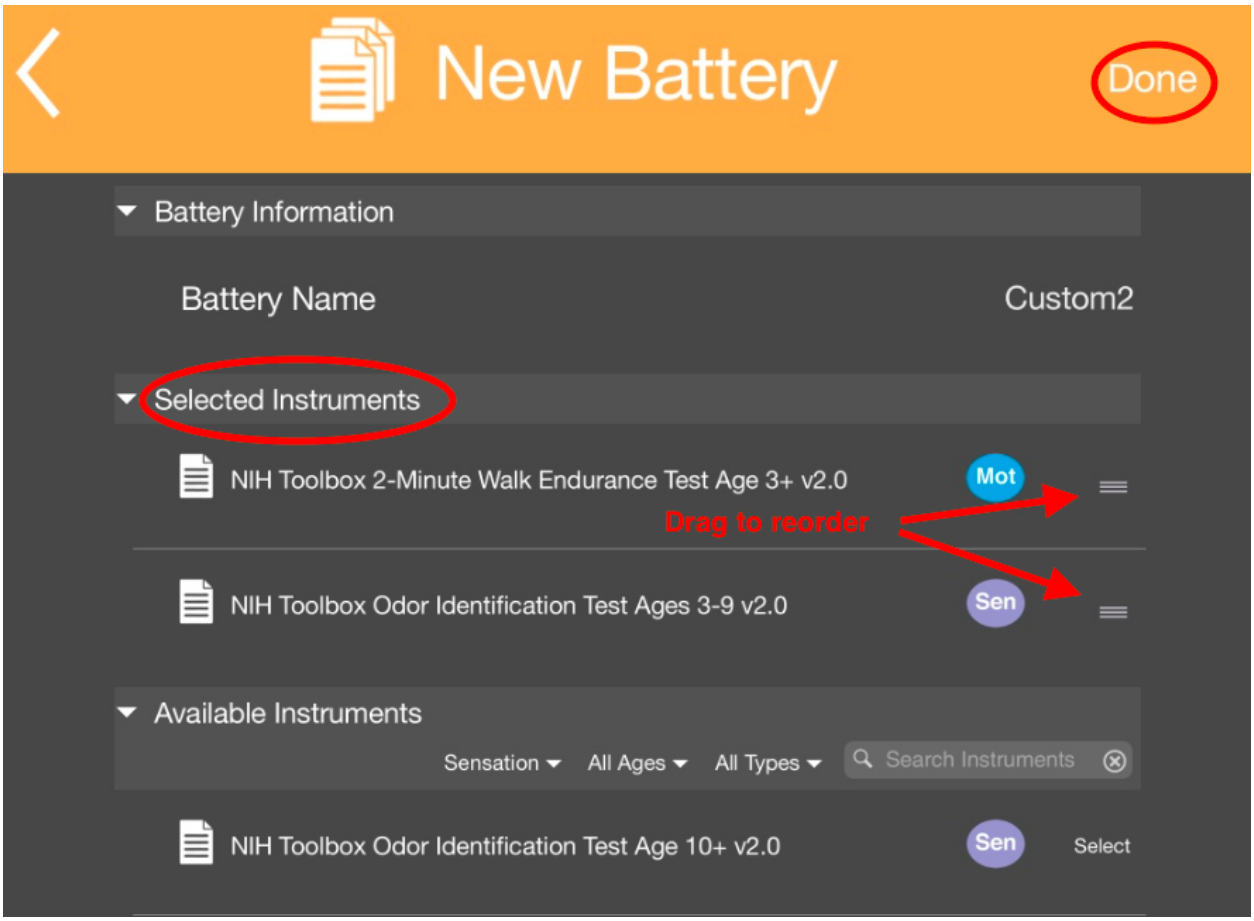
Step 1: Tap ***Create New Battery*** in the upper right corner of the screen.

Step 2: Enter the new battery's name (required) and select instruments to be included in this battery from the list of Available Instruments.



Selected instruments will move to the upper part of the screen and be listed under Selected Instruments.

Step 3: **Reorder** the selected instruments by dragging them up or down, using the ☰ symbol to the right of the instrument name.



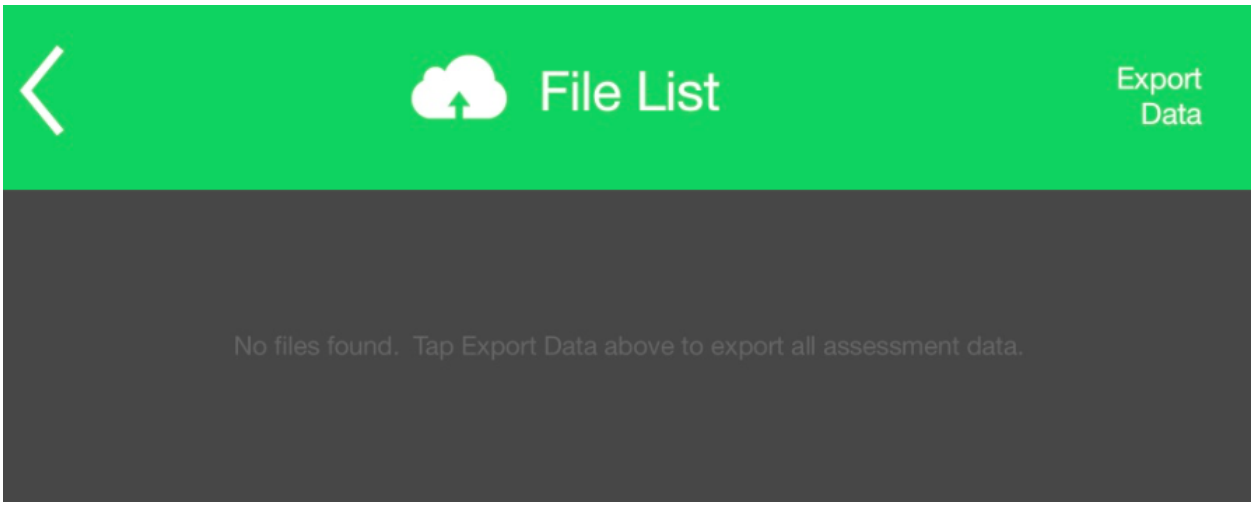
Tap ***Done*** in the upper right corner of the screen or the ***arrow*** in the upper left corner to save the selection and return to the previous screen.

B.4.4 Export Data

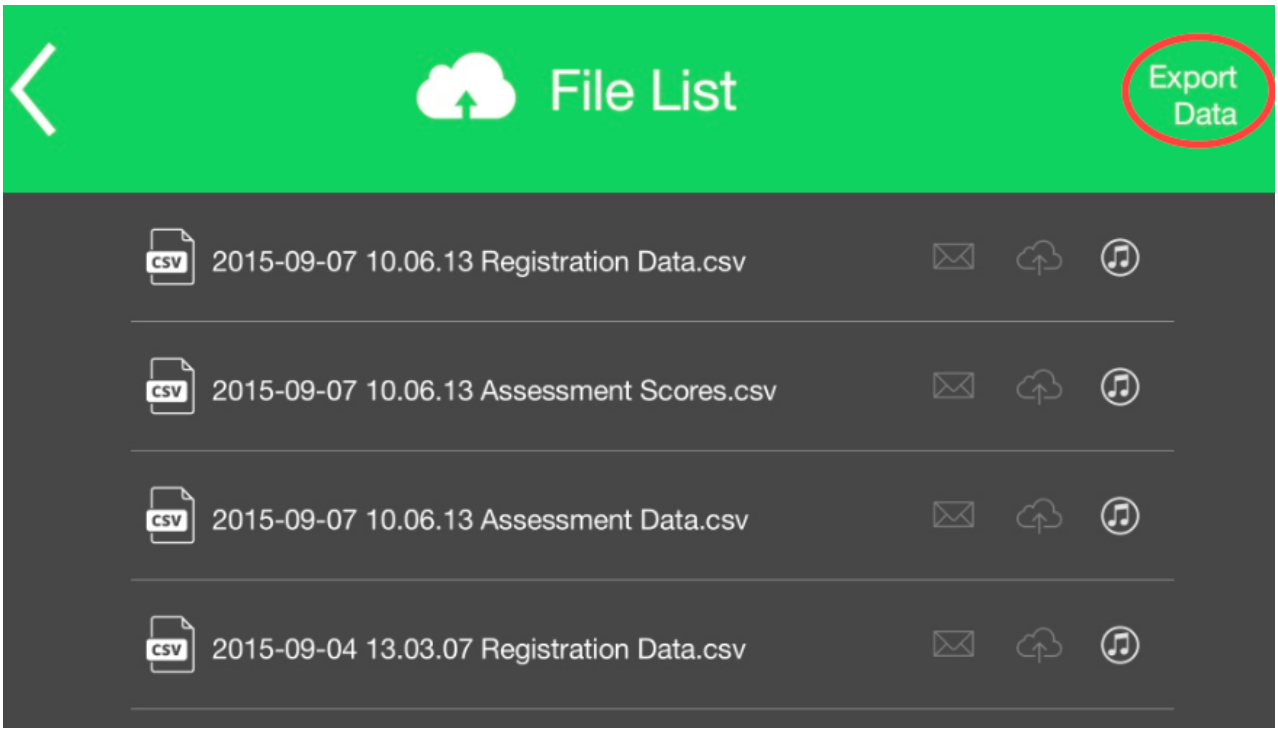
The Export Data button allows the user to export data collected on a given iPad. At any point when export is selected, it will contain all the data cumulatively collected on that iPad. There are three options to transfer data files from the iPad to another device (i.e., computer connected to a backup server): e-mail, iCloud drive, and file sharing via iTunes (hard-wired). Only file sharing via iTunes is activated by default. To activate the ability to email files and upload them to iCloud, please update Data Security in the NIH Toolbox app Settings. Data security settings can be updated at any time: before or after data files were generated.

There are three steps to exporting data:

Step 1: Tap the ***Export Data*** button on the app's home screen. The next screen (File List) will be either blank, if no files were previously created or contain the list of previously generated files.



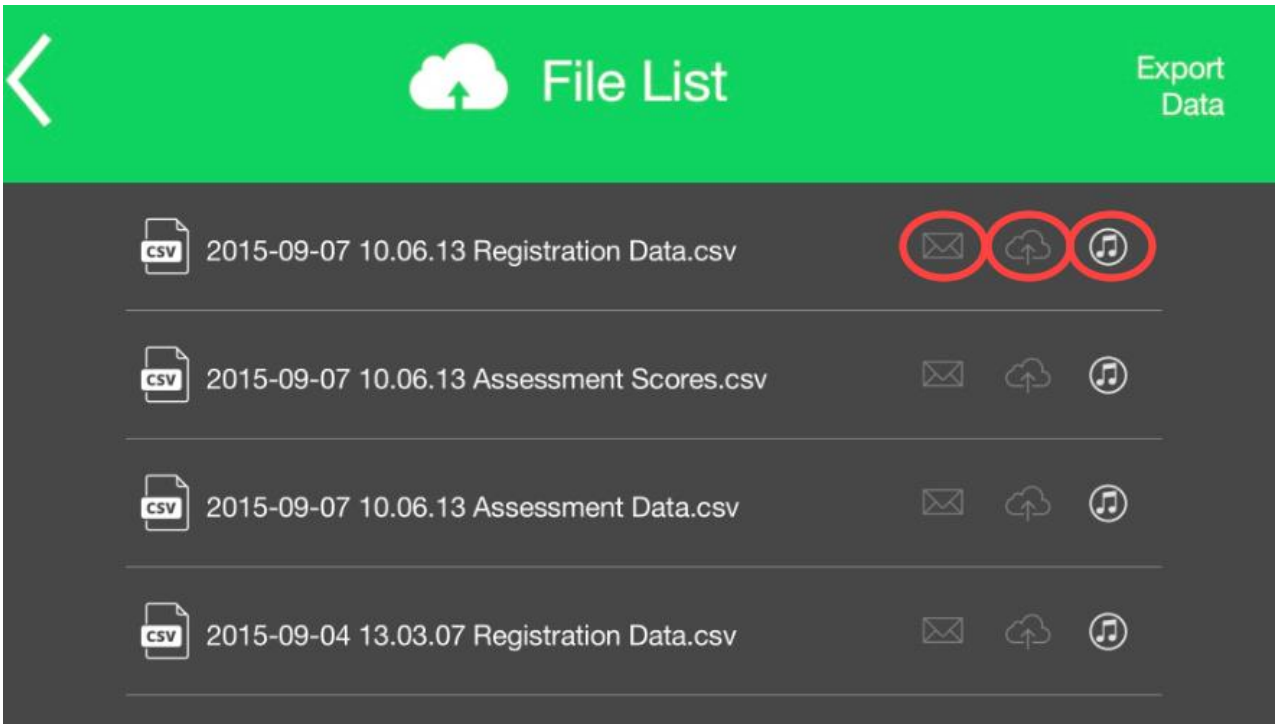
Step 2: Tap the ***Export Data*** button in the upper right corner of the screen to create/update data files for export.



There are 3 types of data files generated here:

- Registration data (contains participant information entered on this iPad)
- Assessment data (contains data for every item administered to every participant on this iPad)
- Assessment scores (contains scores for every instrument administered to every participant on this iPad)

Step 3: Step 3 tap one of 3 symbols (envelope, iCloud, iTunes).



Option 1: E- mail

To use this option, users need to:

1. Set up the Mail app on the iPad. Mail set-up instructions can be accessed here: https://support.apple.com/en-us/HT201320.
2. Activate the ability to email files. Tap/click here or refer to the NIH Toolbox App Settings section for detailed instructions.

Once both of the above conditions are met, tap the ***envelope*** symbol next to the file to be sent via email. This will create a new email message. Enter the destination address and tap ***Send***. This message will arrive from the email address that was used when Mail was set up on this iPad.

When emailing the data files, users should exercise caution and only email the data to secure email accounts (e.g., their institutional email).

Option 2: iCloud drive.

To use this option, users need to:

1. Set up iCloud following the instructions at https://www.apple.com/icloud/setup/ios.html.
2. Activate the ability to upload data files via iCloud, Tap/click here or refer to the NIH Toolbox App Settings section for detailed instructions.

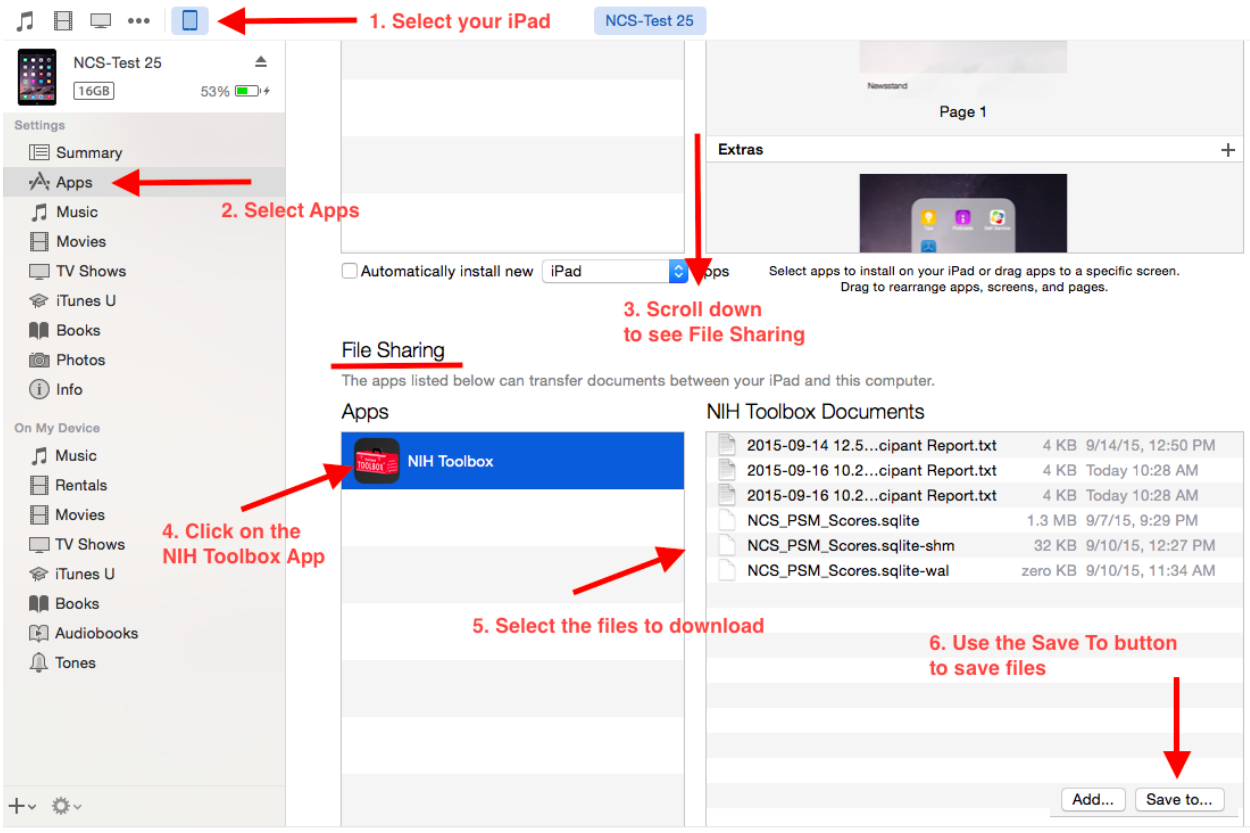
If iCloud is enabled on the iPad, all of the files generated by this app will be immediately available in the iCloud Drive linked to the Apple ID used to install the app. These files can be accessed by logging into iCloud from any browser using the Apple ID associated with the NIH Toolbox app that generated the files.

Option 3: File sharing via iTunes

After generating files on the Export Data screen, plug the iPad into a computer with iTunes version 12.2.2 or later, and launch iTunes.

1. In iTunes, when the iPad appears on the top line of icons, click it.
2. Under the iPad click Apps to see the apps installed on the iPad.
3. While Apps is highlighted on the left, scroll the right pane to get to the bottom to find File Sharing.
4. In the File Sharing section, click on the NIH Toolbox app on the left.
5. The files that have been shared by the app will be shown on the right.
6. Use the Save To… button at the lower right to copy the file(s) from the iPad to the computer.

This list is updated in real-time. So, without leaving iTunes while plugged into the computer, you can run the app on the iPad, generate files on the Export Data screen, and immediately see the files in the File Sharing list.



Data Safeguards

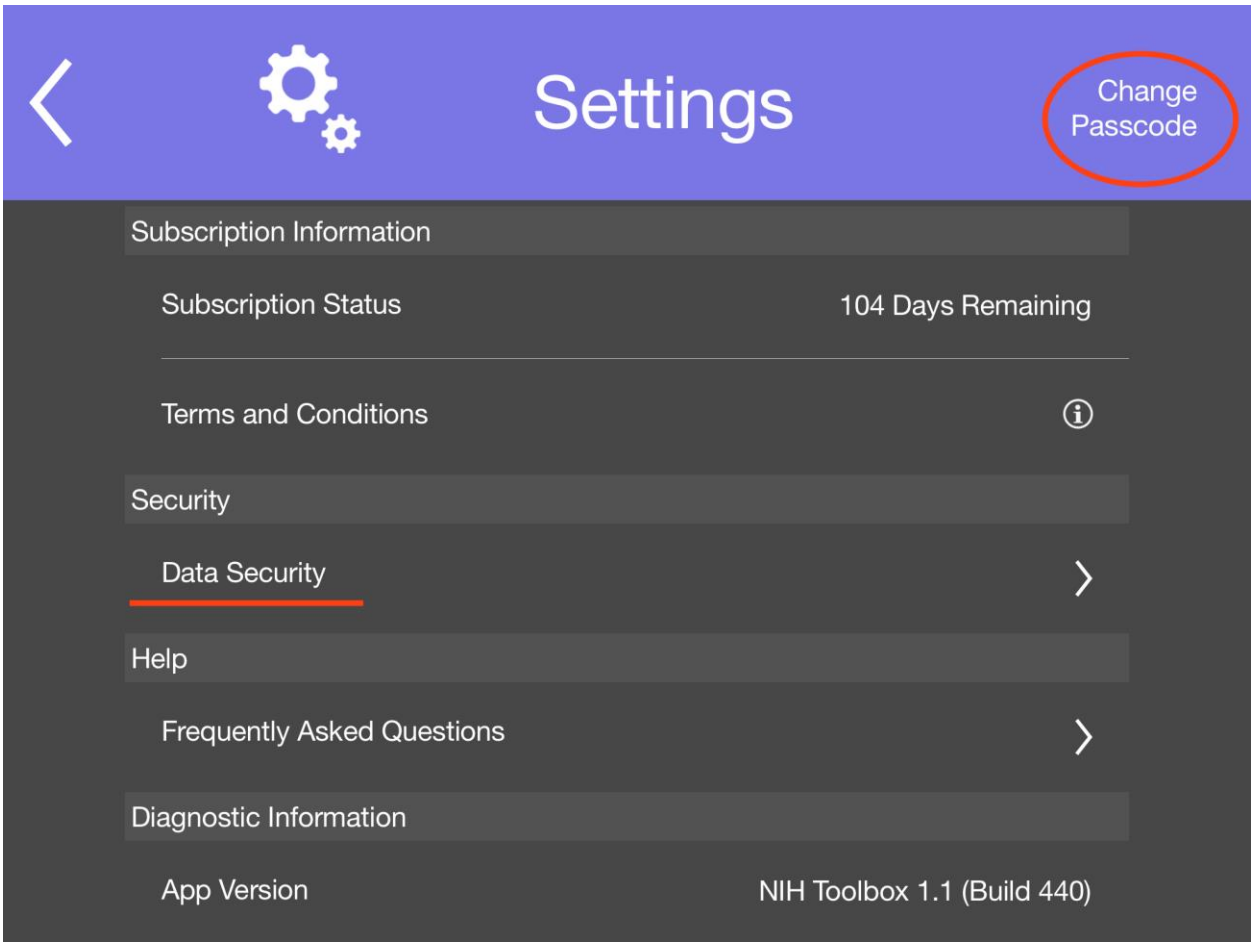
Data stored on this iPad are protected by a number of safeguards. These include:

1. The passcode set for this iPad
2. The passcode set for the NIH Toolbox app
3. Requiring the administrator to enter the app passcode at the end of an assessment, before returning to the home screen

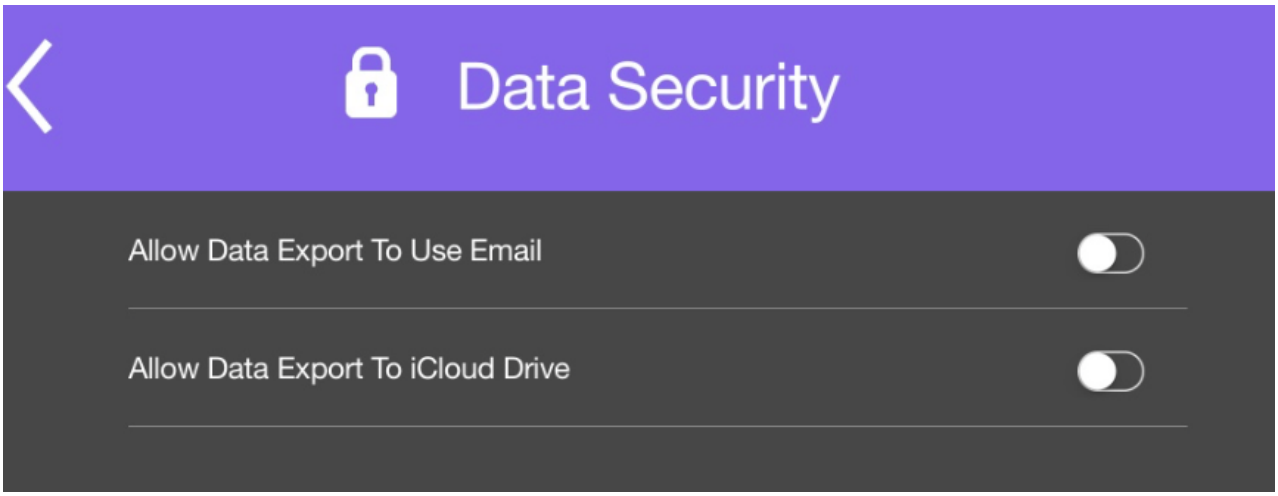
iCloud Security and Privacy policies can be found here: https://support.apple.com/en-us/HT202303 (Internet connection is required to use this link).

B.4.5 NIH Toolbox App Settings

- View subscription information (e.g., how much time is left on the subscription)
- View NIH Toolbox app Terms & Conditions
- Change the app data security settings (enable/disable data export via email and iCloud)
- View FAQs
- View diagnostic information that may be needed when contacting Support
- Change the app passcode



To change the data security settings, tap on Data Security, then update the settings:



To return to Data Export instructions tap/click here.

C. Administering NIH Toolbox

This section contains information about each of the four NIH Toolbox domains: Cognition, Emotion, Motor and Sensation, as well as descriptions of individual instruments, the equipment and materials needed for their administration, and age-specific instructions for administering them.

It is recommended that the iPad be placed in a case both for its protection and so that the angle of the iPad can be placed at multiple positions, to ensure participant comfort. Positioning the iPad so that it is at an angle of about 60 degrees from the table works best. However, if that setup is not effective for the participant, the examiner should adjust the angle so that it is most comfortable, while still being easily visible and accessible to touch. Placing the iPad flat on the table is generally not recommended. Please note that selected tests (e.g., visual acuity) require that the iPad be placed perpendicular to the table and at eye level for the participant; using an iPad "easel" or something similar may be used for this and all other tests if preferred. See Appendix 4 for more information on suggested equipment.

When an examiner administers an instrument to a participant within the app, the first screen they will see is a title screen that contains the instrument name or a shortened version of the name. Please note that the name displayed on this screen often does not exactly match the full name of the instrument displayed when the user/examiner is selecting measures to be administered as part of an assessment. Appendix 5 contains a key to these abbreviations. The first column in the appendix shows the title screen as it is displayed at the start of the instrument, and the second column gives the corresponding full name of the instrument as it appears for selection elsewhere in the app.

A detailed list of equipment and materials needed to administer the entire NIH Toolbox can be found in Appendix 4.

C.1 NIH Toolbox Touch Screen Tutorial

NIH Toolbox Touch Screen Tutorial 3+ is available and recommended for anyone not familiar with using an iPad or similar device. It is particularly useful for young children and older adults who may need reassurance that they are able to complete the assessment competently. If used, it should be added as the very first instrument in the assessment.

Description

This series of screens is designed to help participants to use the iPad and specifically the touch screen.

To help the participant get comfortable with the touch screen, the examiner may want to demonstrate, move the participant's finger, or, in other ways, encourage the participant to do the required actions.

The task is introduced with the Title Screen: NIH Toolbox Touch Screen Tutorial 3+. At the bottom of the screen is a button **Touch and Hold Here to Continue**. Touch and hold that button to begin the tutorial.

Read the next screen to the participant: **First, you will practice touching pictures on the screen.** When finished reading, touch the button at the bottom of the screen that says: **Touch and Hold Here to Continue.**

Read: **Touch the flower on the screen.** After participant touches the flower, the next screen appears. If participant does not touch the flower, the flower remains on the screen.

Read: **Good! Now we are going to do some more.** Touch the button at the bottom of the screen that says: **Touch and Hold Here to Continue**.

Read: **Now, touch the star.** After participant touches the star, the next screen appears. If participant does not touch the star, the star remains on the screen.

Read: **Good! Let's do one more.** Touch the button at the bottom of the screen that says: **Touch and Hold Here to Continue**.

Read: **Now, touch the apple.** After participant touches the apple, the next screen appears. If participant does not touch the apple, the apple remains on the screen.

Read: **Good! Now, you are ready to continue.** When finished reading, touch the button at the bottom of the screen that says: **Touch and Hold Here to Continue**.

C.2 Cognition Domain

Cognition refers to the mental processes involved in gaining knowledge and comprehension such as thinking, knowing, remembering, judging, and problem solving. These higher-level functions of the brain encompass language, imagination, perception, and the planning and execution of complex behaviors.

There is an Early Childhood Cognition Battery designed for ages 3-6 and a Cognition Battery for ages 7-85, or you can create a custom battery.

Early Childhood Cognition Battery
NIH Toolbox instrument development focused special attention on assessing young children to ensure that all tests and surveys given would be developmentally appropriate for ages 3-6. The Early Childhood Cognition Battery includes instruments to assess the following constructs: Attention, Episodic Memory, Executive Function and Language.

Cognition Battery
The NIH Toolbox Cognition Battery is recommended for ages 7+. It consists of instruments that assess the following constructs: Executive Function, Attention, Episodic Memory, Language, Processing Speed, and Working Memory.

Cognition instruments are not available for immediate use in the app. To access these instruments, a user must submit a short application for approval. Users who have been approved to use NIH Toolbox Cognition instruments in Assessment Center (web-based version of NIH Toolbox) will be approved without submitting any additional information. New users will be asked to submit credentials demonstrating they have the appropriate knowledge, skills, training and experience to responsibly use NIH Toolbox measures, or are working under the supervision of someone qualified to use those measures.
Application instructions can be found in the app, when touching the “lock” icon next to any cognition instrument. Once approved, a user will receive a code via email to enter on their iPad, and instruments can then be immediately administered. The user will also receive other restricted materials at that time (e.g., NIH Toolbox Oral Reading Recognition Test Pronunciation Guide and the NIH Toolbox List Sorting Working Memory Examiner Answer Sheet).

For more information about access to cognition instruments, please contact cognition@nihtoolbox.org.

Cognition Battery Constructs	Definition
Executive Function	The capacity to plan, organize and monitor the execution of behaviors that are strategically directed in a goal-oriented manner. The NIH Toolbox focuses on two components: 1. Inhibition of automatic response tendencies that may interfere with achieving a goal, which is measured by the NIH Toolbox Flanker Inhibitory Control and Attention Test; and 2. Set shifting, or the capacity for switching among multiple aspects of a strategy or task, which is measured by the NIH Toolbox Dimensional Change Card Sort Test
Attention	The allocation of one's limited capacities to deal with an abundance of environmental stimulation. It is measured by the NIH Toolbox Flanker Inhibitory Control and Attention Test.
Episodic Memory	The acquisition, storage and retrieval of new information. It involves conscious recollection of information learned within a context. It is measured by the NIH Toolbox Picture Sequence Memory Test.
Language	A set of mental processes that translate thought into symbols (words, gestures) that can be shared among individuals for purposes of communication. The NIH Toolbox focuses on two aspects of language: 1. Vocabulary knowledge, measured by the NIH Toolbox Picture Vocabulary Test; and 2. Oral reading (decoding) skills, measured by the NIH Toolbox Oral Reading Recognition Test.
Processing Speed	The amount of time it takes to mentally process a set amount of information, or the amount of information that can be processed within a certain unit of time. It is a measure that reflects mental efficiency, and is measured by the NIH Toolbox Pattern Comparison Processing Speed Test.
Working Memory	The capacity of an individual to hold information in a short-term buffer and manipulate the information. It is measured by the NIH Toolbox List Sorting Working Memory Test.

Cognition Battery Instruments	Ages	Time to Administer (minutes)
NIH Toolbox Picture Vocabulary Test	3-85*	4
NIH Toolbox Flanker Inhibitory Control and Attention Test	3-85*	3
NIH Toolbox List Sorting Working Memory Test	7-85	7
NIH Toolbox Dimensional Change Card Sort Test	3-85*	4
NIH Toolbox Pattern Comparison Processing Speed Test	7-85	3
NIH Toolbox Picture Sequence Memory Test	3-85*	7
NIH Toolbox Oral Reading Recognition Test	7-85	3

*Part of the NIH Toolbox Early Childhood Cognition Battery

In addition to the instruments available as part of the cognition battery (which may also be administered individually), there are Supplemental instruments that may be administered to participants – either in addition to or, more likely, in lieu of cognition battery instruments assessing the same construct. These supplemental instruments generally extend the age range or the "floor" of these constructs downward. More information about these instruments is available below.

Cognition Supplemental Instruments	Ages	Time to Administer (minutes)
NIH Toolbox Pattern Comparison Processing Speed Test	3-6	3
NIH Toolbox Flanker Inhibitory Control and Attention Test with Developmental Extension (Experimental)	3-7	7
NIH Toolbox Dimensional Change Card Sort Test with Developmental Extension (Experimental)	3-7	8

NOTE The ***"Time to Administer (minutes)"*** column gives users an idea of how long each test might take; however, please note that testing times could vary based on how prepared the test administrator is going into the session, individual differences among participants, and/or other unplanned activities that may occur during testing.

C.2.1 NIH Toolbox Picture Vocabulary Test

The NIH Toolbox Picture Vocabulary Test is a measure of receptive vocabulary administered in a computer-adaptive test (CAT) format.

Equipment and materials needed:

- iPad

The participant is presented with four pictures on the iPad screen and an audio recording saying a word. The participant is instructed to touch the picture that most closely shows the meaning of the word. After the participant makes a choice, another set of pictures automatically appears with the next item and associated audio file.

Because the test uses a variable-length CAT, some participants see fewer items than others. The specific words presented depend on the participant's performance. The number of items presented depends on age and performance; for most participants, the measure will last approximately 5 minutes and will contain about 25 items. The computer will administer each item one by one, in an untimed fashion, until the test is completed.

The test uses age (for participants younger than 18) and education (for participants 18 and older) to determine which items it initially presents. There is, however, an override in the participant information screen. If an examiner feels that a participant should begin the test at a level higher or lower than that determined by his/her education and age, the examiner should use this feature. Using the override may shorten the test. It is important to note that even if the override is not used, the test will eventually arrive at the same score whether the examiner used the override or not.

General Instructions:

1. The opening/introductory instructions and the introductions to the test items are printed **on the iPad screen** and are read to the participants; all other instructions are pre-recorded.

2. The introduction and test instructions differ somewhat for younger and older participants. The required version will appear automatically for the examiner to read.

3. Before beginning, make sure the volume is loud enough so that participants can hear the pre-recorded feedback and the presentation of the words.

4. If the participant says he/she does not understand the word after several repetitions, the examiner, if present, may say the word **one more time**.

If there is an examiner present and a participant has difficulty touching the screen, the participant may point and the examiner can touch the screen. In this case, the examiner should say something like the following to the participant: **You can point to your choice and then I will touch the screen for you.**

C.2.1.1 NIH Toolbox Picture Vocabulary Test Instructions Age 3+

The task is introduced with the Title Screen: NIH Toolbox PVT 3+. At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the test.

The next screen is slightly different for participants ages 3-6 and those ages 7+. The two screens are printed below.

Ages 3-6:

Say: **Let's look at some pictures. You'll hear a word and see four pictures on the screen. Touch the picture that means the same as the word that was said. Some words will be easy and some will be harder. Answer as best as you can. If you need to hear a word again, I can play it again.**

If you think you made a mistake and want to change your last answer, I can bring back that word and pictures. Are you ready to play?

When participant is ready, touch button that says ***Touch and Hold Here to Continue***.

Ages 7+:

Say: **You are going to be asked the meaning of some words. For each item, you will hear a word and see four pictures on the screen. Touch the picture that you think best matches the meaning of the word that was said. If you are not sure, make your best guess. If you need to hear the word again, touch the button that has a picture of an EAR, also called the PLAY AGAIN button. After you touch a picture, you will hear a new word and see more pictures.**

You will keep hearing words and touching pictures until you are done. If you want to change your last answer, touch the button with the HAND that says GO BACK. The pictures you just saw will reappear and you will hear the word again. Touch your choice, and then more words and pictures will appear. Tell me when you are ready to start.

When participant is ready, touch button that says ***Touch and Hold Here to Continue***.

Practice item 1:

An audio recording says: **Let's try one for practice: Banana. Touch the picture of Banana.**

If correct, the audio recording says: **That's right!** The program will automatically go to the next practice item.

If incorrect, the Banana picture will light up and an audio recording will say: **This is a banana. Let's try again.**

The examiner should allow the participant up to three chances to answer this practice item correctly.

After three unsuccessful attempts by the participant, the examiner should touch the picture of the banana and say: **This is a banana.** The next practice item will appear automatically.

Practice item 2:

An audio recording says: **Let's try another one: Spoon. Touch the picture of Spoon.**

If correct, an audio recording says: **That's right!**

If incorrect, the Spoon picture will light up and an audio recording will say: **This is a spoon. Let's try again.**

The examiner should allow the participant up to three chances to answer this practice item correctly.

After three unsuccessful attempts by the participant, the examiner should touch the picture of the spoon and say: **This is a spoon.**

The introduction to the test items will appear automatically.

Test items

The introductory screen to the test items is slightly different for participants ages 3-6 and those ages 7+. The two screens are printed below.

Ages 3-6:

Read: **Now, let's try some more. Remember, you will hear a voice say a word and then you will see four pictures. One of the pictures will show what the word means. Touch that picture and you will hear a new word and see four more pictures. Any questions?**

When participant is ready, touch button that says ***Touch and Hold Here to Continue***.

Ages 7+:

Read: **Now, you're going to do some more. Remember, you will hear a word and then you will see four pictures. One of the pictures will show what the word means. Touch that picture and you will hear a new word and see four more pictures. Again, touch the picture that shows what the word means. If you don't know, make your best guess. Any questions?**

When participant is ready, touch button that says ***Touch and Hold Here to Continue***.

An audio recording will introduce each word with the instructions: **Touch…** (for participants ages 3-6) and just the **Word** (for participants ages 7+). The items will continue in this format until the test is completed.

Remember: If a participant has difficulty touching the screen, he/she may point and the examiner can touch the screen. In this case, the examiner should say something like the following to the participant: **You can point to your choice and then I will touch the screen for you**. If the participant says that he/she does not understand the word after several repetitions, the examiner may say the word ONCE MORE.

C.2.2 NIH Toolbox Flanker Inhibitory Control and Attention Test

The NIH Toolbox Flanker Inhibitory Control and Attention Test is a measure of inhibitory control and attention. The Flanker requires the participant to focus on a particular stimulus while inhibiting attention to the stimuli flanking it.

Equipment and materials needed:

- iPad
- Home base

Detailed information on equipment and materials needed for all tests can be found in Appendix 4.

Younger participants first see a fish flanked by two other fish on each side. If they perform well enough, they continue to a version with an arrow flanked by other arrows on each side.

Older participants (ages 8-85 years) are always presented with arrows instead of fish.

All participants are instructed to choose one of two buttons on the screen that corresponds to the direction in which the MIDDLE fish or arrow is pointing.

On congruent trials, all the fish or arrows are pointing in the same direction. On incongruent trials, the flanking fish or arrows are pointing in the opposite direction of the middle fish or arrow. Congruent and incongruent trials are mixed.

The word *middle* appears on the screen for all participants; for younger participants (ages 3-11), an audio recording also says "MIDDLE," to remind participants where to focus (a star in the middle of the screen).

All the instructions are on the iPad screen. The examiner reads them to and/or with the participant and points out the relevant aspects of the stimuli on the screen.

There are two versions of this measure for ages 3-7. The first is the standard NIH Toolbox Flanker test for ages 3-7. The second is an experimental version (with “developmental extension,” or DEXT) that was designed to extend the range of assessment downward, for those participants who have difficulty understanding the standard task. Both versions yield a score for the standard measure, and the DEXT version provides simple raw scores and percentages for the experimental items.

Standard administration (all ages):

Practice items

In this version, all participants are first presented with four practice trials. If the participant responds incorrectly, an audio recording provides feedback and highlights the correct choice. Similarly, a separate audio file plays each time the participant gets a practice item correct. Participants must get at least three out of four practice trials correct to advance to the test items. If these participants get fewer than three out of four practice trials correct, they can complete up to two more sets of four practice trials, with the same cutoff to advance to the test trials.

If the participant does not respond after five seconds to a practice trial, prompt him/her to do so by **saying:** Choose one of the buttons.

Test Trials

One block of 20 test trials is used for all participants; 3-7-year-olds have fish stimuli and ages 8+ have arrow stimuli.

If a participant ages 3-7 misses no more than one congruent and one incongruent item on the fish trials, he/she will also receive a set of 20 arrow trials.

Training for home base precedes the arrow trials for both the 3-7 and 8+ year olds.

Developmental Extension (DEXT ages 3-7):

In this version, participants are given five practice trials. If the participant responds incorrectly, an audio recording provides feedback and highlights the correct choice. Similarly, a separate audio file plays each time the participant gets a practice item correct.

A participant must succeed in 4 out of 5 practice trials to move on.

If a participant does succeed, the test administration continues in the same manner as the standard administration described above.

If he/she does not succeed on the practice trials, he/she is directed to the developmental extension of this measure. In addition, participants will be directed to the developmental extension if they do not achieve at least 75% correct on congruent fish trials OR at least 25% correct on incongruent fish trials. The logic underlying the developmental extension is detailed in the test instructions (FLANKER 3-7 DEXT).

Age-specific test instructions:

NIH Toolbox Flanker Inhibitory Control and Attention Test Instructions Ages 3-7

NIH Toolbox Flanker Inhibitory Control and Attention Test Instructions Ages 3-7 with Developmental Extension (DEXT)

NIH Toolbox Flanker Inhibitory Control and Attention Test Instructions Ages 8-11

NIH Toolbox Flanker Inhibitory Control and Attention Test Instructions Ages 12+

C.2.2.1 NIH Toolbox Flanker Inhibitory Control and Attention Test Instructions Ages 3-7

This table outlines the item content read by as well as the actions for the examiner.

	iPad screen written content	Examiner (E) Action
Title Screen	NIH Toolbox FL 3-7	E touches and holds button to continue.
PRACTICE Introduction	Here is a Fish! This is the TAIL -> [fish] <- This is the MOUTH. The fish is pointing this way, the same way the fish is swimming.	E points to screen; then touches and holds button to continue.
	Here the MIDDLE fish is circled. Can you point to the MIDDLE fish?	Child points; E touches and holds button to continue.
	Where is the MIDDLE fish here?	Child points; E touches and holds button to continue.
	Look at all the fish!!! The fish in the MIDDLE is hungry.	E touches and holds button to continue.
	To feed the MIDDLE fish, choose the button that matches the way the MIDDLE fish is pointing.	E demonstrates using index finger to touch arrow button.
	Here the MIDDLE fish is pointing this way, so I'll choose this button.	E demonstrates touching arrow button.
	If the MIDDLE fish is pointing this way, choose this button.	E demonstrates touching arrow button.
	Sometimes all the fish point the same way. Sometimes the MIDDLE fish points a different way, like this: [incongruent fish]. You should always choose the button that matches the way the MIDDLE fish is pointing. You will hear the word MIDDLE to remind you.	E points; then chooses arrow button.
	Here, the MIDDLE fish is pointing this way, so I'll choose this button.	E points; then chooses arrow button.
	Here, the MIDDLE fish is pointing this way, so I'll choose this button.	E points; then chooses arrow button.
Transition to practice items	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen; then touches and holds button to continue.
Practice Items set 1	4 practice items	
More practice, if less than 3 out of 4 correct on set 1	Let's practice some more. If the MIDDLE fish is pointing this way, choose this button.	E points; then chooses arrow button.
	If the MIDDLE fish is pointing this way, choose this button.	E points; then chooses arrow button.
Transition to more practice items	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen; then touches and holds button to continue.
Practice Items set 2	4 practice items	

	iPad screen written content	Examiner (E) Action
More practice, if less than 3 out of 4 correct on set 2	Let's practice some more. If the MIDDLE fish is pointing this way, choose this button.	E points; then chooses arrow button.
	If the MIDDLE fish is pointing this way, choose this button.	E points, then chooses arrow button.
Transition to more practice items	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen; then touches and holds button to continue.
Practice Items set 3	4 practice items	
Test ends, if less than 3 out of 4 correct on set 3		
Test items transition	Now you're ready to do this without me. Keep your eyes on the star ★ in the middle of the screen.	E reads screen; then touches and holds button to continue.
Test items	20 test items (fish)	
Test ends, if less than 90% success on fish		
Home Base training, if 90% or greater success on fish	Now you will do the same thing, but you will see arrows instead of fish. But first we are going to learn about Home Base. This is your Home Base. Put your finger on the Home Base and wait for the next picture. In this game, put your finger back on Home Base after each answer.	E reads screen and points to the home base; then touches and holds button to continue.
	Like before, choose the button that matches the way the middle arrow is pointing.	E points; then chooses arrow button.
	Sometimes all the arrows will point the same way. Sometimes the middle arrow will point a different way. You should always choose the button that matches the way the MIDDLE arrow is pointing.	E reads screen, points to the arrows, and demonstrates touching arrow button.
More test items (arrows)	Now you try. Keep your eyes on the star ★ in the middle of the screen. Remember; put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.
	20 test items (arrows)	

C.2.2.2 NIH Toolbox Flanker Inhibitory Control and Attention Test Instructions Ages 3-7 with Developmental Extension (DEXT)

This table outlines the item content read by and the actions to be performed by the examiner and the child.

	iPad screen written content	Child (C) & Examiner (E) Actions
Title Screen	NIH Toolbox FL 3-7 DEXT	E touches and holds button to continue.
PRACTICE Introduction	Here is a Fish! This is the TAIL -> [fish] <- This is the MOUTH. The fish is pointing this way, the same way the fish is swimming.	E points to screen; then touches and holds button to continue.
	Here the MIDDLE fish is circled. Can you point to the MIDDLE fish?	Child points; E touches and holds button to continue.
	Where is the MIDDLE fish here?	Child points; E touches and holds button to continue.
	Look at all the fish!!! The fish in the MIDDLE is hungry.	E touches and holds button to continue.
	To feed the MIDDLE fish, choose the button that matches the way the MIDDLE fish is pointing.	E demonstrates using index finger to touch arrow button.
	Here the MIDDLE fish is pointing this way, so I'll choose this button.	E demonstrates touching arrow button.
	If the MIDDLE fish is pointing this way, choose this button.	E demonstrates touching arrow button.
	Sometimes all the fish point the same way. Sometimes the MIDDLE fish points a different way, like this: [incongruent fish]. You should always choose the button that matches the way the MIDDLE fish is pointing.	E points; then chooses arrow button.
	Here, the MIDDLE fish is pointing this way, so I'll choose this button.	E points; then chooses arrow button.
	Here, the MIDDLE fish is pointing this way, so I'll choose this button.	E points; then chooses arrow button.

	iPad screen written content	Child (C) & Examiner (E) Actions
Transition to practice items	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen; then touches and holds button to continue.
Practice items	5 practice items	
If less than 4 out of 5 correct	Moves to developmental extension	
Test items transition	Now you're ready to do this without me. Keep your eyes on the star ★ in the middle of the screen.	E reads screen; then touches and holds button to continue.
Test items	20 test items (fish)	
If < 9 congruent trials correct OR **< 2 incongruent trials correct**	Moves to developmental extension	
If correct on >= 11 congruent AND on >= 7 incongruent (no more than 1 incorrect of each)	Now you will do the same thing, but you will see arrows instead of fish. But first we are going to learn about Home Base. This is your Home Base. Put your finger on Home Base and wait for the next picture. In this game, put your finger back on Home Base after each answer.	E reads screen and points to the home base; then touches and holds button to continue.
	Like before, choose the button that matches the way the middle arrow is pointing.	E points; then chooses arrow button.
	Sometimes all the arrows will point the same way. Sometimes the middle arrow will point a different way. You should always choose the button that matches the way the MIDDLE arrow is pointing.	E reads screen, points to the arrows, and demonstrates touching arrow button.
More test items (arrows)	Now you try. Keep your eyes on the star ★ in the middle of the screen. Try to answer as fast as you can. Remember: Put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.
	20 test items (arrows)	

Developmental Extension		
	iPad screen written content	**Child (C) & Examiner (E) Actions**
DEXT Screen 1 – Demo Trial 1	Let's try some more! Here is a Fish. This Fish is HUNGRY! To feed the HUNGRY Fish, we have to touch the button pointing the same way that the HUNGRY Fish is swimming (Right button is flashing after 5 seconds)	E reads screen and then E touches right arrow. Screen won't advance until correct arrow is touched. When correct arrow is touched, bubbles sound plays and iPad says: **Mmm, thank you.**
	Touch and hold here to continue screen appears.	E touches and holds button to continue.
DEXT Screen 2 – Practice Trial 1	Now it's your turn. Feed the HUNGRY Fish by touching the button that points the same way the HUNGRY Fish is swimming.	E reads screen. Child touches an arrow. If incorrect, iPad says: **Let's try again**. Repeats until correct arrow is touched. If correct, bubbles sound plays and iPad says: **Mmm, thank you.**
	Touch and hold here to continue appears on screen.	E touches and holds button to continue.
DEXT Screen 3- – Transition	Let's try some more.	E reads screen; then E touches and holds button to continue.
DEXT Screens 4-8	5 practice items with fish bowl on screen	
DEXT Screen 9 – Demo Trial 2	Here's another HUNGRY Fish. We don't see the food, but it's still there. I am going to touch the button pointing the same way the hungry fish is swimming.	E reads screen and then E touches left arrow. Screen won't advance until correct arrow is touched. When correct, bubbles sound plays and iPad says: **Mmm, thank you.**
	Touch and hold here to continue appears on screen.	E touches and holds button to continue.
DEXT Screen 10 – Practice Trial 2	Now it's your turn. Touch the button that's pointing the same way this Fish is swimming.	E reads screen. Child touches an arrow. If incorrect, iPad says: **Let's try again**. Repeats until correct arrow is touched. If correct, bubbles sound plays and iPad says: **Mmm, thank you.**
	Touch and hold here to continue appears on screen.	E touches and holds button to continue.
DEXT Screen 11 – Transition	Let's try some more!	E reads screen and then E touches and holds button to continue.

Developmental Extension		
	iPad screen written content	**Child (C) & Examiner (E) Actions**
DEXT Screens 12-16	5 practice items without fish bowl	If either arrow is touched, bubbles sound plays. If neither arrow is touched, moves to new item after 10 seconds.
If less than 4 of 5 correct on screens 12-16, test is discontinued. **If 4 or more correct, test continues to Screen 17**		
DEXT Screen 17 – Demo Trial 3	Look at this! The hungry Fish has friends. These fish friends are NOT hungry, only the MIDDLE Fish is hungry. Watch me while I touch the button that is pointing the same way that the hungry MIDDLE Fish is swimming!	E reads screen and then E touches right arrow. When correct arrow is touched, bubbles sound plays and iPad says: **Mmm, thank you.**
	Touch and hold here to continue appears on screen.	E touches and holds button to continue.
DEXT Screen 18 – Practice Trial 3	Now it's your turn to feed the hungry MIDDLE fish. I want you to touch the button pointing the same way the MIDDLE Fish is swimming.	E reads screen. C touches an arrow. If incorrect, iPad says: **Let's try again**. Repeats until correct. If correct, bubbles sound plays and iPad says: **Mmm, thank you.**
	Touch and hold here to continue appears on screen.	E touches and holds button to continue.
DEXT Screen 19 – Transition	Now you try. Keep your eyes on the star in the middle of the screen.	E reads screen and then E touches and holds button to continue.
DEXT Screens 20-24	5 items (Spacing/Size/Color block)	If either arrow is touched, bubbles sound plays. If neither arrow is touched, moves on to new item after 10 seconds.
DEXT Screens 25-29	5 items (Size/Color block)	If either arrow is touched, bubbles sound plays. If neither arrow is touched, moves on to new item after 10 seconds.
DEXT Screens 30-34	5 items (Color block)	If either arrow is touched, bubbles sound plays. If neither arrow is touched, moves on to new item after 10 seconds.
DEXT Screens 35-39	5 items (Toolbox Flanker Fish block)	If either arrow is touched, bubbles sound plays. If neither arrow is touched, moves on to new item after 10 seconds.
After screen 39, DEXT ends.		

C.2.2.3 NIH Toolbox Flanker Inhibitory Control and Attention Test Instructions Ages 8-11

This table outlines the item content read by as well as the actions for the examiner.

	iPad screen written content	Examiner (E) Action
Title Screen	NIH Toolbox FL 8-11	E touches and holds button to continue.
Home Base Introductions	In this task, you will see a row of arrows pointing different ways. But first, we are going to learn about Home Base. This is your Home Base. Put your finger on Home Base and wait for the next picture.	E reads screen and points to the home base; then touches and holds button to continue.
Practice Introduction	You will see a row of arrows. You should choose the button that matches the way the MIDDLE arrow is pointing.	E points to left arrow and demonstrates touching the correct arrow.
	If the MIDDLE arrow is pointing this way, choose this button.	E demonstrates touching arrow button.
	If the MIDDLE arrow is pointing this way, choose this button.	E demonstrates touching arrow button.
	Sometimes all the arrows will point the same way. Sometimes the middle arrow will point a different way, like this [picture of incongruent arrows]. You should always choose the button that matches the way the MIDDLE arrow is pointing.	E reads screen, points to the arrows, and demonstrates touching arrow button.
Transition to practice items	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Remember, put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.
Practice Items set 1	4 practice items	
More practice, if less than 3 out of 4 correct on set 1	Let's practice some more. If the MIDDLE arrow is pointing this way, choose this button.	E reads screen and demonstrates touching arrow button.
	If the MIDDLE arrow is pointing this way, choose that button.	E demonstrates touching arrow button.

	iPad screen written content	Examiner (E) Action
Transition to more practice items	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Remember, put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.
Practice Items set 2	4 practice items	
More practice, if less than 3 out of 4 correct on set 2	Let's practice some more. If the MIDDLE arrow is pointing this way, choose this button.	E reads screen and demonstrates touching arrow button.
	If the MIDDLE arrow is pointing this way, choose that button.	E demonstrates touching arrow button.
Transition to more practice items	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Remember, put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.
Practice Items set 3	4 practice items	
Test ends, if less than 3 out of 4 correct on set 3		
Test Items Introduction	Now you're ready to do this without me. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Remember, put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.
Test items	20 items (arrows)	

C.2.2.4 NIH Toolbox Flanker Inhibitory Control and Attention Test Instructions Ages 12+

This table outlines the item content read by as well as the actions for the examiner.

	iPad screen written content	Examiner (E) Action
Title Screen	NIH Toolbox FL 12+	E touches and holds button to continue.
Home Base Introductions	In this task, you will see a row of arrows pointing different ways. But first, we are going to learn about Home Base. This is your Home Base. Put your finger on Home Base and wait for the next picture.	E reads screen and points to the home base; then touches and holds button to continue.
Practice Introduction	You will see a row of arrows. You should choose the button that matches the way the MIDDLE arrow is pointing.	E points to left arrow and demonstrates touching the correct arrow.
	If the MIDDLE arrow is pointing this way, choose this button.	E demonstrates touching arrow button.
	If the MIDDLE arrow is pointing this way, choose this button.	E demonstrates touching arrow button.
	Sometimes all the arrows will point the same way. Sometimes the middle arrow will point a different way, like this. You should always choose the button that matches the way the MIDDLE arrow is pointing. You will see the word MIDDLE to remind you.	E reads screen, points to the arrows, and demonstrates touching arrow button.
Transition to practice items	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Remember, put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.
Practice Items set 1	4 practice items	
More practice, if less than 3 out of 4 correct on set 1	Let's practice some more. If the MIDDLE arrow is pointing this way, choose this button.	E reads screen and demonstrates touching arrow button.
	If the MIDDLE arrow is pointing this way, choose this button.	E demonstrates touching arrow button.
Transition to more practice items	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Remember, put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.

	iPad screen written content	Examiner (E) Action
Practice Items set 2	4 practice items	
More practice, if less than 3 out of 4 correct on set 2	Let's practice some more. If the MIDDLE arrow is pointing this way, choose this button.	E reads screen and demonstrates touching arrow button.
	If the MIDDLE arrow is pointing this way, choose this button.	E demonstrates touching arrow button.
Transition to more practice items	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Remember, put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.
Practice Items set 3	4 practice items	
Test ends, if less than 3 out of 4 correct on set 3		
Test Items Introduction	Now you're ready to do this without me. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Remember, put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.
Test items	20 items (arrows)	

C.2.3 NIH Toolbox List Sorting Working Memory Test

This task assesses working memory and requires the participant to recall and sequence different visually and orally presented stimuli. Pictures of different foods and animals are displayed with both an accompanying audio recording and written text that name the item. The participant is asked to say the items back to the examiner in size order from smallest to largest.

Equipment and materials needed:

- iPad
- Bluetooth wireless keyboard
- NIH Toolbox List Sorting Working Memory Examiner Answer Sheet

Detailed information on equipment and materials needed for all tests can be found in Appendix 4.

Setting up Bluetooth Wireless Keyboard:

- Go to the Settings app of the iPad and make sure Bluetooth is turned on.
- Make sure the keyboard is in discovery mode by pressing the round button at the top right end of the keyboard and the small green light to the left of the button begins flashing.
- Select the Keyboard when it appears on the My Devices list on the iPad.
- When a pop up window appears on the iPad screen, follow the instructions and enter the required code on the keyboard.

  The usual keyboard on the iPad will not work when the external keyboard is working. To turn off the external keyboard, press the round button at the top right end of the keyboard, move at least 15 meters from the iPad with the keyboard, or touch the “information” button ⓘ on the iPad and touch “forget this device.”

Using the Keyboard

Once the participant answers (gives the list of objects), the examiner types **1** if the response (list) is correct or **0** if the response (list) is incorrect.

For the practice items, after choosing **1** or **0**, the examiner presses the spacebar to move on to the next item (list of objects). There is feedback presented by the prerecorded voice and repeated trials for errors.

For the test items, after the examiner chooses **1** or **0**, the question: **Are you ready?** appears on the screen. The examiner presses the spacebar to move on to the next item (list of objects) after the participant answers the question affirmatively.

The Left arrow takes the participant back to the previous item.

Ctrl + Shift on the Keyboard is equivalent to the gesture used to STOP an administration on the iPad. Like the iPad, when Ctrl + Shift is entered on the keyboard, a login screen will pop up and ask for the password of the user who started the assessment. As described earlier, three options will appear: resume, skip, and stop.

There are two different conditions: 1-List and 2-List.

In the 1-List condition, participants are required to order a series of objects (*either* food or animals) in size order from smallest to largest. The test begins with a two object item. The participant must succeed at one of the first two object items to continue. (See the discontinue rules below).

In the 2-List condition, participants are presented *both* food and animals and are first asked to say the food objects in size order, and then the animal objects in size order.

In each condition, participants ages 7-85 have two practice items; both items are presented in a "flashing" mode.

Because the participant answers orally, this measure cannot be self-administered. An examiner must record on a wireless keyboard whether each response is correct; specifically, after the participant answers (gives the list of objects), the examiner types **1** if the response (list) is correct or **0** if the response (list) is incorrect.

For the practice items, after choosing **1** or **0**, the examiner presses the **spacebar** to move on to the next item (list of objects). There is feedback presented by a prerecorded voice and there are repeated trials for errors.

For the test items, after the examiner chooses **1** or **0**, the question: **Are you ready?** appears on the screen. Once confirming that the participant is ready and attending, the examiner presses the **spacebar** to move on to the next item (list of objects).

For the examiner, there is a code at the bottom right side of the iPad screen to indicate which item is being administered. The examiner should use this code to look up the correct response on the NIH Toolbox List Sorting Working Memory Examiner Answer Sheet, and then score the item using the keyboard (**1** or **0** and pressing the spacebar).

Introduction:

For an item to be marked correct, the participant must name all the stimuli in the correct order without any intrusions. A participant may change his/her response. It is also acceptable for a participant to give a synonym for either a food item or an animal. For example, in English, responses such as these should be marked as correct: puppy for dog, bunny for rabbit, and lamb for sheep.

Several discontinue rules are embedded in the software:

- If a participant does not complete a practice item correctly, the test itself is not administered.
- If a participant has incorrect responses on both parts of a test item, the test condition being administered (1-List or 2-List) is discontinued.
- If the participant has a score of 1 point as the sum of the two sets of 2-stimulus items (*pig-mouse* and *bird-cow*; *banana-watermelon* and *apple-blueberry*) *and* a score of 0 points on the set of 3-stimulus items (*pumpkin-strawberry-banana* and *dog-horse*-rabbit) in the 1-list condition, the test is discontinued and the 2-list condition is *not* administered.
- If the participant has a score of 0 points as the sum of the two sets of 2-stimulus items (*pig-mouse* and *bird-cow*; *banana-watermelon* and *apple-blueberry*), the test is discontinued and the 2-list condition is *not* administered.

Throughout the test, the examiner may need to remind the participant: **It is important to pay attention to the size of the objects <u>on the screen</u>** (not what they may have experienced) **when putting things in size order from smallest to biggest.**
If necessary, examiners can provide short breaks between items. It is also acceptable during the 2-List condition to remind participants of the rules (e.g., tell me the foods first, then the animals).

C.2.3.1 NIH Toolbox List Sorting Working Memory Test Instructions Age 7+

Before beginning the test, the wireless keyboard should be paired by Bluetooth with the iPad, if this has not already been done. While administering this measure, the examiner needs to be able to view the iPad and have the keyboard and the NIH Toolbox List Sorting Working Memory Test Examiner Answer Sheet easily accessible for scoring participant responses.

The task is introduced with the Title Screen: NIH Toolbox LS 7+. To check the Bluetooth connection, the examiner is asked at the bottom of the page to: ***Press Spacebar to Continue.*** Touching the **spacebar** begins the test. If the spacebar does not work, try repairing the keyboard or changing the batteries in the keyboard.

REVIEW: All the 1-List practice items have the same format. First, the examiner asks for the names of the pictures in size order from smallest to largest. If the participant answers incorrectly, there are two more opportunities to get a correct answer. The first comes after a verbal explanation and a repeat of the question; the second comes after replaying the item on the screen, followed by a verbal explanation and then repeating the question. If, after three opportunities, the participant continues to answer incorrectly, the test will be discontinued and no more items will be presented. Both practice items are detailed below.

1-List Condition

Read the screen: **You are going to see some pictures one at a time on the screen. After each set of pictures, you will see a blank screen. When you see the blank screen, I want you to tell me the names of the pictures in size order from smallest to biggest. For example, if I show you a motorcycle, a bus, and a car, you would say: motorcycle, car, bus.**

From now on, you will hear most of the instructions from the iPad. Do you have any questions?

Let's practice. Press **Spacebar** to continue.

1-List Practice Item 1:

Trial 1: After the pictures are presented and the screen is blank, an audio recording says: **Now say the animals in size order.**

Correct Response: If participant says DOG, HORSE, press **1** and then press **spacebar**. An audio recording says: **That's right.** When it appears on the screen, ask: **Are you ready?** When the participant answers affirmatively, press the **spacebar** and 1-List Practice Item 2 will be presented.

Incorrect Response: If participant does not say DOG, HORSE, press **0** and then press **spacebar.** An audio recording says: **Let's try that again.**

Trial 2 (if Trial 1 was incorrect): An audio recording continues: **You saw a DOG and a HORSE; the DOG is smaller than the HORSE. Now say the animals in size order.**

Correct Response: If participant says DOG, HORSE, press **1** and then press **spacebar**. An audio recording says: **That's right.** When it appears on the screen, ask: **Are you ready?** When the participant answers affirmatively, press the **spacebar** and 1-List Practice Item 2 will be presented.

Incorrect Response: If participant does not say DOG, HORSE, press **0** and then press **spacebar**. An audio recording says: **Let's try that one more time.**

Trial 3 (if Trial 2 was incorrect): After the pictures are presented one more time and the screen is blank, an audio recording says: **You saw a DOG and a HORSE; the DOG is smaller than the HORSE. Now say the smaller animal and then the bigger animal.**

Correct Response: If participant says DOG, HORSE, press **1** and then press **spacebar**. An audio recording says: **That's right.** When it appears on the screen, ask: **Are you ready?** When the participant answers affirmatively, press the **spacebar** and 1-List Practice Item 2 will be presented.

If participant answers the question *incorrectly* after 3 trials, press **0 and then press spacebar**. **Test will be discontinued.**

1-List Practice Item 2*:*

Trial 1: After the pictures are presented and the screen is blank, an audio recording says: **Now say the animals in size order, starting with the smallest animal.**

Correct Response: If participant says RABBIT, SHEEP, ELEPHANT, press **1** and then press **spacebar**. An audio recording says: **That's right.** When it appears on the screen, ask: **Are you ready?** When the participant answers affirmatively, press the **spacebar** and the 1-List introduction screen will be presented.

Incorrect Response: If participant does not say RABBIT, SHEEP, ELEPHANT, press **0** and then press **spacebar**. An audio recording says: **Let's try that again.**

Trial 2 (if Trial 1 was incorrect): An audio recording continues: **You saw a RABBIT, SHEEP and ELEPHANT; the RABBIT is smaller than the SHEEP and the SHEEP is smaller than the ELEPHANT. The RABBIT is the smallest animal, the SHEEP is the next biggest animal, and the ELEPHANT is the biggest animal. Now, say the animals in size order, starting with the smallest animal.**

Correct Response: If participant says RABBIT, SHEEP, ELEPHANT, press **1** and then press **spacebar**. An audio recording says: **That's right.** When it appears on the screen, ask: **Are you ready?** When the participant answers affirmatively, press the **spacebar** and the 1-List introduction screen will be presented.

Incorrect Response: If participant does not say RABBIT, SHEEP, ELEPHANT, press **0** and then press **spacebar**. An audio recording says: **Let's try that once more.**

Trial 3 (if Trial 2 was incorrect): After the pictures are presented again and the screen is blank, an audio recording says: **You saw a RABBIT, SHEEP and ELEPHANT; the RABBIT is smaller than the SHEEP and the SHEEP is smaller than the ELEPHANT. The RABBIT is the smallest animal, the SHEEP is the next biggest animal, and the ELEPHANT is the biggest animal. Now, say the animals in size order, starting with the smallest animal.**

Correct Response: If participant says RABBIT, SHEEP, ELEPHANT, press **1** and then press **spacebar**. An audio recording says: **That's right.** When it appears on the screen, ask: **Are you ready?** When the participant answers affirmatively, press the **spacebar** and presentation of the 1-List introduction screen will be presented.

If participant answers the question *incorrectly*, press **0 and then press spacebar**. **Test will be discontinued.**

The 1-list practice items are summarized in the table below:

P1	**Presentation: Horse Dog (Flashing)**		
	Question	***Response***	***Next step***
Q1	Smaller first, then Bigger	If Dog Horse, press 1; If Horse Dog, press 0	If 1, goes to P2; If 0, goes to Q2
Q2	Smaller first, then Bigger	If Dog Horse, press 1; If Horse Dog, press 0	If 1, goes to P2; If 0, goes to Q3
Q3	Smaller first, then Bigger	If Dog Horse, press 1; If Horse Dog, press 0	If 1, goes to P2; If 0, test discontinued
P2	**Presentation: Elephant Rabbit Sheep (flashing)**		
	Question	**Response**	**Next step**
Q1	Animals in size order, starting with the smallest	If Rabbit, Sheep, Elephant, press 1; If any other order, press 0	If 1, goes to 1-list test items; If 0, goes to Q2
Q2	Animals in size order, starting with the smallest	If Rabbit, Sheep, Elephant, press 1; If any other order, press 0	If 1, goes to 1-list test items; If 0, goes to Q3
Q3	Animals in size order, starting with the smallest	If Rabbit, Sheep, Elephant, press 1; If any other order, press 0	If 1, goes to 1-list test items; If 0, test discontinued

1-List Test Items:

Say: **Let's look at some more pictures. Remember, after you see the pictures you will see a blank screen. Once you see this blank screen, I want you to tell me what you just saw in size order from smallest to biggest. It is important to pay attention to the size of the object on the screen when putting things in size order from smallest to biggest. Are you ready?**

Press the **spacebar** to continue and the presentation of the 1-List test items will begin.

As noted earlier, after the examiner chooses **1** or **0**, the question: **Are you ready?** appears on the screen. Once confirming that the participant is ready and attending, the examiner presses the **spacebar** to move on to the next item (list of objects).

For the examiner, there is a code at the bottom right side of the iPad screen to indicate which item is being administered. The examiner should use this code to look up the correct response on the NIH Toolbox List Sorting Working Memory Test Examiner Answer Sheet, and then score the item using the keyboard (1 or 0).

2-List Condition

REVIEW: The 2-List practice items have the same format. First, the examiner asks for the food from smallest to largest and then for the animals from smallest to largest. If the answer is correct, the examiner moves on to the next question. If the participant answers incorrectly, there are two more opportunities to get a correct answer. The first opportunity comes after a verbal explanation and a repeat of the question; the second comes after replaying the item on the screen, followed by a verbal explanation and then a repeat of the question. If after a total of three opportunities, the participant continues to answer incorrectly, the test will be discontinued and no more items will be presented. The practice items are detailed below.

Say: **We're going to look at more pictures. This time, you will see both food and animals in a set of pictures. I'd like you to tell me the food first, and then the animals, in size order from smallest to biggest. It is important to pay attention to the size of the object on the screen when putting things in size order from smallest to biggest. Let's start by looking at some more pictures together.** Press **Spacebar** to continue.

After each answer, the examiner should indicate whether it was correct (**1**) or incorrect (**0**) on the keyboard. Then the question **Are you ready?** appears on the screen. *When the participant answers affirmatively, the examiner should press the **spacebar** to continue*.

2-List Practice Item 1:

Trial 1: After the pictures are presented and the screen is blank, an audio recording says: **Say the food, then the animal.**

Correct Response: If participant says BANANA, BEAR, press **1** and then press **spacebar**. An audio recording says: **That's right.** When it appears on the screen, ask: **Are you ready?** When the participant answers affirmatively, press the **spacebar** and 2-List Practice Item 2 will be presented.

Incorrect Response: If participant does not say BANANA, BEAR, press **0** and then press **spacebar**. An audio recording says: **Let's try that again.**

Trial 2 (if Trial 1 was incorrect): An audio recording continues: **The BEAR is an animal; the BANANA is a food. Now say the food first and then the animal.**

Correct Response: If participant says BANANA, BEAR, press **1** and then press **spacebar**. An audio recording says: **That's right.** When it appears on the screen, ask: **Are you ready?** When the participant answers affirmatively, press the **spacebar** and 2-List Practice Item 2 will be presented.

Incorrect Response: If participant does not say BANANA, BEAR, press **0** and then press **spacebar**. An audio recording says: **Let's try that once more.**

Trial 3 (if Trial 2 was incorrect): After the pictures are presented and the screen is blank, an audio recording says: **The BEAR is an animal; the BANANA is a food. Now say the food first and then the animal.** If participant says BANANA, BEAR, press **1** and then press **spacebar**. An audio recording says: **That's right.** When it appears on the screen, ask: **Are you ready?** When the participant answers affirmatively, press the **spacebar** and 2-List Practice Item 2 will be presented.

If participant answers the question *incorrectly*, press **0 and then press spacebar**. **Test will be discontinued.**

2-List Practice Item 2:

Trial 1: After the pictures are presented and the screen is blank, an audio recording says: **Say the food in size order from smallest to biggest and then say the animals in size order from smallest to biggest.**

Correct Response: If participant says PINEAPPLE, FROG, TIGER, press **1** and then press **spacebar**. An audio recording says: **That's right.** When it appears on the screen, ask: **Are you ready?** When the participant answers affirmatively, press the **spacebar** and the 2-list introduction screen will be presented.

Incorrect Response: If participant does not say PINEAPPLE, FROG, TIGER, press **0** and then press **spacebar**. An audio recording says: **Let's try that again.**

Trial 2 (if Trial 1 was incorrect): An audio recording continues: **You saw a frog, a pineapple, and a tiger. The pineapple is a food; the frog is the smallest animal, and the tiger is the biggest animal. Now, say the food in size order starting with the smallest food, and then the animals in size order, from smallest to biggest.**

Correct Response**:** If participant says PINEAPPLE, FROG, TIGER, press **1** and then press **spacebar**. An audio recording says: **That's right.** When it appears on the screen, ask: **Are you ready?** When the participant answers affirmatively, press the **spacebar** and the 2-list introduction screen will be presented.

Incorrect Response: If participant does not say PINEAPPLE, FROG, TIGER, press **0** and an audio recording says: **Let's try that one more time.**

Trial 3 (if Trial 2 was incorrect): After the pictures are presented and the screen is blank, an audio recording says: **You saw a frog, a pineapple, and a tiger. The pineapple is a food; the frog is the smallest animal, and the tiger is the biggest animal. Now, say the food in size order starting with the smallest food, and then the animals in size order, from smallest to biggest.**

Correct Response: If participant says PINEAPPLE, FROG, TIGER, press **1** and then press **spacebar**. An audio recording says: **That's right.** When it appears on the screen, ask: **Are you ready?** When the participant answers affirmatively, press the **spacebar** and presentation of the 2- list introduction screen will be presented.

If participant answers the question *incorrectly*, press **0 and then press spacebar**. **Test will be discontinued.**

The 2-list practice items are summarized in the table below:

P1	**Presentation: Bear Banana (Flashing)**		
	Question	***Response***	***Next step***
Q1	Food first, then Animal	If Banana Bear, press 1; If Bear Banana, press 0	If 1, goes to P2; If 0, goes to Q2
Q2	Food first, then Animal	If Banana Bear, press 1; If Bear Banana, press 0	If 1, goes to P2; If 0, goes to Q3
Q3	Food first, then Animal	If Banana Bear, press 1; If Bear Banana, press 0	If 1, goes to P2; If 0, test discontinued
P2	**Presentation: Frog Pineapple Tiger (flashing)**		
	Question	***Response***	***Next step***
Q1	Food first, then Animals in size order, starting with the smallest	If Pineapple Frog Tiger, press 1; If any other order, press 0	If 1, goes to 2-list test items; If 0, goes to Q2
Q2	Food first, then Animals in size order, starting with the smallest	If Pineapple Frog Tiger, press 1; If any other order, press 0	If 1, goes to 2-list test items; If 0, goes to Q3
Q3	Food first, then Animals in size order, starting with the smallest	If Pineapple Frog Tiger, press 1; If any other order, press 0	If 1, goes to 2-list test items; If 0, test discontinued

2-List Test Items

Read: **Let's look at some more pictures. Remember, after you see the pictures, you will see a blank screen. Once you see this blank screen, tell me the foods first in size order from smallest to biggest, then the animals, in size order from smallest to biggest. Are you ready?** Press the **spacebar** to continue and the presentation of the 2-List test items will begin.

As before, after the examiner chooses **1** or **0**, the question: **Are you ready?** appears on the screen. Once confirming that the participant is ready and attending, the examiner presses the **spacebar** to move on to the next item (list of objects).

NOTE There is a code at the bottom right side of the iPad screen to indicate which item is being administered. The examiner should use this code to look up the correct response on the NIH Toolbox List Sorting Working Memory Test Examiner Answer Sheet, and then score the item using the keyboard (1 or 0).

C.2.4 NIH Toolbox Dimensional Change Card Sort Test (DCCS)

The NIH Toolbox Dimensional Change Card Sort Test is a measure of cognitive flexibility and attention. Two target pictures are presented that vary along two dimensions (e.g., shape and color). Participants are asked to match a series of bivalent test pictures (e.g., yellow balls and blue trucks) to the target pictures, first according to one dimension (e.g., color) and then, after a number of trials, according to the other dimension (e.g., shape).

The relevant dimension for sorting is indicated by a cue word (e.g., "shape" or "color") that appears on the screen for all participants and that, for young children ages 3-11, is also spoken by a prerecorded audio file.

Equipment and materials needed:

- iPad
- Home base

Detailed information on equipment and materials needed for all tests can be found in Appendix 4.

Practice items use white and brown colors and a Rabbit and Sailboat as shapes. Test items use blue and yellow colors and a Ball and Truck as shapes.

All instructions are on the iPad screen: The examiner reads them to and/or with the participant and points out the relevant aspects of the stimuli on the screen. The next screen appears when either the examiner or participant makes a choice.

There are two versions of this measure for ages 3-7. The first is the standard NIH Toolbox DCCS test for ages 3-7. The second is an experimental version (with "developmental extension," or DEXT) that was designed to extend the range of assessment downward, for those participants who have difficulty understanding the standard task. Both versions yield a score for the standard measure, and the DEXT version provides simple raw scores and percentages for the experimental items.

Standard administration:

Practice items

Participants of all ages are given four practice trials with each dimension – color and shape. If the participant responds incorrectly, an audio recording prompts him/her to choose the correct image. Similarly, a separate audio file plays each time the participant gets a practice item correct.

Rules:

- Participants must get at least three out of four practice trials correct to advance to the practice trials for the next dimension and then to the test trials.
- If a participant of any age gets fewer than three out of four practice trials correct, he/she will complete up to two more sets of four practice trials, with the same cutoff to advance to the test trials.
- If a participant of any age does not meet the cutoff, the task will automatically discontinue.

If the participant does not respond after five seconds, the examiner should prompt him/her, **saying:** Choose one of the pictures.

Test Trials

The examiner should not prompt the participant to respond during the test trials. If the participant does not respond after ten seconds, the program will automatically advance to the next test trial.

Ages 3-7

During the test trials, participants 3-7 years of age first complete a set of five trials to sort according to color. If these young participants succeed in four of the five test trials, the program advances to a set of five trials to sort according to shape.

If the young participants do not get four out of five test trials correct on either color or shape, the test ends.

If participants ages 3-7 meet the criterion on the second set of test trials (i.e., post-switch), they will complete the mixed block, consisting of 30 shape/color trials.

Because the mixed trials are scored for reaction time, these young participants need to be trained in the use of Home Base, where the participant places his/her index finger between trials. Training for Home Base precedes the introduction of the mixed trials for 3-7-year-olds.

Age 8+

Participants age 8+ receive training for Home Base before learning about the test. The test trials for participants 8+ years of age consist of a mixed block of 30 shape/color items.

Developmental Extension (DEXT ages 3-7)

In this version, participants are given five practice trials on each dimension – color and shape. If the participant responds incorrectly, an audio recording provides feedback and highlights the correct image. Similarly, a separate audio file plays each time the participant gets a practice item correct.

Participants must succeed in 4 out of 5 practice trials in this version to move on.

If they do succeed, the test administration continues in the same manner as the standard administration described above.

If they do not succeed on the practice trials of one dimension, they are directed to the developmental extension of this measure. In addition, participants will be directed to the developmental extension if they do not achieve 4 out of 5 correct on either the 5 color trials ("pre-switch") or the 5 shape trials ("post-switch"). The logic underlying this developmental extension is detailed in the test instructions (DCCS 3-7 DEXT).

Age-specific test instructions:

NIH Toolbox Dimensional Change Card Sort Test Ages 3-7

NIH Toolbox Dimensional Change Card Sort Test Ages 3-7 with Developmental Extension (DEXT)

NIH Toolbox Dimensional Change Card Sort Test Ages 8-11

NIH Toolbox Dimensional Change Card Sort Test Ages 12+

C.2.4.1 ***NIH Toolbox Dimensional Change Card Sort Test Instructions Ages 3-7***

This table outlines the item content read by as well as the actions for the examiner.

	iPad screen written content	Examiner (E) Actions
Title Screen	NIH Toolbox DCCS 3-7	E touches and holds button to continue.
Practice Intro	We're going to play a matching game with colors and shapes.	E reads screen, then touches and holds button to continue.
SHAPE Intro	We'll play the SHAPE game first. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E points to BOAT, then demonstrates use of button.
	If it's a RABBIT, choose that picture.	E demonstrates use of button
Transition	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
Shape Practice set 1	4 items sorted by shape	
More practice, if less than 3 out of 4 correct on set 1	Let's practice that some more. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E reads screen, then chooses BOAT.
	If it's a RABBIT, choose that picture.	E reads screen, then chooses RABBIT.
Transition	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
Shape Practice set 2	4 items sorted by shape	
More practice, if less than 3 out of 4 correct on set 2	Let's practice that some more. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E chooses BOAT.
	If it's a RABBIT, choose that picture.	E chooses RABBIT.
Transition	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
Shape Practice set 3	4 items sorted by shape	
Test ends, if less than 3 out of 4 correct on set 3		

	iPad screen written content	Examiner (E) Actions
COLOR intro	We can also match by COLOR. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's BROWN, choose this picture.	E points to, then chooses, BROWN picture.
	If it's WHITE, choose that picture.	E points to, then chooses, WHITE picture.
Transition	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
Color Practice set 1	4 items sorted by color	
More practice, if less than 3 out of 4 correct on set 1	Let's practice some more. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's WHITE, choose this picture.	E chooses WHITE picture.
	If it's BROWN, choose that picture.	E chooses BROWN picture.
Transition	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
Color Practice set 2	4 items sorted by color	
More practice, if less than 3 out of 4 correct on set 2	Let's practice some more. In the COLOR game, choose the picture that is the same COLOR as the picture in the middle of the screen. If it's WHITE, choose this picture.	E chooses WHITE picture.
	If it's BROWN, choose that picture.	E chooses BROWN picture.
Transition	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
Color Practice set 3	4 items sorted by color	
Test ends, if less than 3 out of 4 correct on set 3		

	iPad screen written content	Examiner (E) Actions
COLOR and SHAPE intro	Now, we're going to play with some different shapes and colors. This time we'll use BALLS and TRUCKS that are YELLOW and BLUE.	E reads screen, then touches and holds button to continue.
Pre-switch intro	Let's start with the COLOR game. Remember the COLOR game? In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's a BLUE one, choose this picture.	E chooses BLUE picture.
	And if it's a YELLOW one, choose that picture.	E chooses YELLOW picture.
Transition	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
Color items	5 items sorted by color (if child does not get 4 of 5 correct, test terminates)	
Test ends, if less than 4 of 5 correct		
Post-switch intro	Now we're going to play the SHAPE game. Remember the SHAPE game? In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a TRUCK, choose this picture.	E chooses TRUCK.
	And if it's a BALL, choose that picture.	E chooses BALL.
Transition	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
Shape items	5 items sorted by shape	
Test ends, if less than 4 of 5 correct		
Home Base before Mixed Items	We can also play both games together. But first we are going to learn about Home Base. This is your Home Base. Put your finger on the Home Base and wait for the next picture. In this new game put your finger back on Home Base after each answer.	E reads screen and points to the home base; then touches and holds button to continue.
Transition to Mixed Trials	Now we are ready to play both games together. Remember, when you hear the word SHAPE, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a TRUCK, choose this picture.	E chooses TRUCK.
	And if it's a BALL, choose that picture.	E chooses BALL.

	iPad screen written content	Examiner (E) Actions
	When you hear the word COLOR, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's a BLUE one, choose this picture.	E chooses BLUE picture.
	And if it's a YELLOW one, choose that picture.	E chooses YELLOW picture.
Transition	Now you try. Keep your eyes on the star ★ in the middle of the screen. Remember: Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
Test items	30 mixed items	

C.2.4.2 NIH Toolbox Dimensional Change Card Sort Test Ages 3-7 with Developmental Extension (DEXT)

This table outlines the item content read by and the actions to be performed by the examiner and the child.

	iPad screen written content	Examiner (E) & Child (C) Actions
Title Screen	NIH Toolbox DCCS 3-7 (DEXT)	E touches and holds button to continue.
Practice Intro	We're going to play a matching game with colors and shapes.	E reads screen, then touches and holds button to continue.
SHAPE Intro	We'll play the SHAPE game first. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E points to BOAT, then demonstrates use of button.
	If it's a RABBIT, choose that picture.	E demonstrates use of button.
Transition	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
Shape Practice	5 items sorted by shape	
If less than 4 out of 5 correct	Moves to developmental extension (DEXT Phase 1)	
COLOR intro	We can also match by COLOR. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's BROWN, choose this picture.	E points to, then chooses, BROWN picture.
	If it's WHITE, choose that picture.	E points to, then chooses, WHITE picture.
Transition	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
Color Practice	5 items sorted by color	
If less than 4 out of 5 correct	Moves to developmental extension (DEXT Phase 1)	
COLOR and SHAPE intro	Now, we're going to play with some different shapes and colors. This time we'll use BALLS and TRUCKS that are YELLOW and BLUE.	E reads screen, then touches and holds button to continue.
Pre-switch intro	Let's start with the COLOR game. Remember the COLOR game? In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's a BLUE one, choose this picture.	E chooses BLUE picture.
	And if it's a YELLOW one, choose that picture.	E chooses YELLOW picture.
Transition	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
Color items	5 items sorted by color	
If less than 4 out	Moves to developmental extension (DEXT Phase 2)	

	iPad screen written content	Examiner (E) & Child (C) Actions
of 5 correct		
Post-switch intro	Now we're going to play the SHAPE game. Remember the SHAPE game? In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a TRUCK, choose this picture.	E chooses TRUCK.
	And if it's a BALL, choose that picture.	E chooses BALL.
Transition	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
Shape items	5 items sorted by shape	
If less than 4 out of 5 correct	Moves to developmental extension (DEXT Phase 3)	
Home Base before Mixed Items	We can also play both games together. But first we are going to learn about Home Base. This is your Home Base. Put your finger on Home Base and wait for the next picture. In this new game, put your finger back on Home Base after each answer.	E reads screen and points to the home base; then touches and holds button to continue.
Transition to Mixed Trials	Now we are ready to play both games together. Remember, when you hear the word SHAPE, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a TRUCK, choose this picture.	E chooses TRUCK.
	And if it's a BALL, choose that picture.	E chooses BALL.
	When you hear the word COLOR, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's a BLUE one, choose this picture.	E chooses BLUE picture.
	And if it's a YELLOW one, choose that picture.	E chooses YELLOW picture.
Transition	Now you try. Keep your eyes on the star ★ in the middle of the screen. Try to answer as fast as you can. Remember: Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
Test items	30 mixed items	

DCCS Developmental Extension (DEXT) Phase 1 (Elephant/Fish)		
	iPad screen written content	**Examiner (E) & Child (C) Actions**
1A: Screen 1 – Instructions	Now we are going to play a different game. Look what I have here! I have a fish! Look at these boxes down here. This box has an elephant in it, and this box has a fish in it. I'm going to put the fish in the fish box because that is where it belongs.	E reads screen and points out the relevant aspects. After 10 seconds, the Touch and Hold Here to Continue button appears. E then touches and holds the button to continue.
1A: Screen 2 – Demonstration	See, here is a fish. It goes in the fish box.	E reads screen and touches the fish box, which makes a clicking sound. The Touch and Hold Here to Continue button appears; then E touches and holds the button to continue.
1A: Screen 3 – Fish Rule check	Now, it's going to be your turn to play the fish game! Can you show me where the fish go in the fish game?	E reads screen. C touches a box.
1: Screens 4a & b – Feedback	4a (If correct) Very good, that's right.	E reads screen. Touch and Hold Here to Continue button appears. Then E touches and holds button to advance to next screen.
	4b (If incorrect) Uh oh. Remember, in this game, all fish go in the fish box.	Touch and Hold Here to Continue button appears; after E touches and holds button, screen says: **Can you show me where the fish go in the fish game?** E reads screen and C touches a box, triggering either 4a or 4b.
		When Touch and Hold Here to Continue button appears again, E touches and holds button to advance to next screen.
1A: Screen 5 – Transition	OK, let's play!	E reads screen and then touches and holds button to advance to next screen.
1A: Screen 6 – Rule reminder 1	If it's a fish, then it goes in the fish box. (Appears above the fish box.)	E reads screen and points to fish box; then E touches and holds button to advance to next screen.
1A: Screen 7 – Live Trial 1	Here is a fish. Where does it go?	E reads screen. C touches a box.
1A: Screen 8 – Rule reminder 2	Fish go here. (Appears above the fish box.)	E reads screen and points to fish box; then E touches and holds button to go to next screen.

DCCS Developmental Extension (DEXT) Phase 1 (Elephant/Fish)		
	iPad screen written content	**Examiner (E) & Child (C) Actions**
1A: Screen 9 – Live Trial 2	Here is a fish. Where does it go?	E reads screen. C touches a box.
1A: Screen 10 – Rule reminder 3	If it's a fish, then it goes in the fish box. (Appears above the fish box.)	E reads screen and points to fish box; then E touches and holds button to advance to next screen.
1A: Screen 11 – Live Trial 3	Here is a fish. Where does it go?	E reads screen. C touches a box.
1A: Screen 12 – Rule reminder 4	Fish go here. (Appears above the fish box.)	E reads screen and points to fish box; then E touches and holds button to advance to next screen.
1A: Screen 13 – Live Trial 4	Here is a fish. Where does it go?	E reads screen. C touches a box.
1A: Screen 14 – Rule reminder 5	If it's a fish, then it goes in the fish box. (Appears above the fish box.)	E reads screen and points to fish box; then E touches and holds button to advance to next screen.
1A: Screen 15 – Live Trial 5	Here is a fish. Where does it go?	E reads screen. C touches a box.
If less than 4 of 5 correct, the test is discontinued. If 4 or more correct, the test continues to Phase 1B.		
1B: Screen 1 – Instructions	Now we're going to play a different game. Look what I have here! I have an elephant! I'm going to put the elephant in the elephant box because that's where it belongs.	E reads screen and points out the relevant aspects. After 8 seconds, the Touch and Hold Here to Continue button appears. Then E touches and holds the button to continue.
1B: Screen 2 – Instructions	Now, it's going to be your turn to put the elephant in the elephant box.	E reads screen; after 2 seconds, Touch and Hold Here to continue button appears. Then E touches and holds the button to continue
	OK, let's play.	E reads screen and then touches and holds button to advance to next screen.
1B: Screen 3 – Rule reminder 1	If it's an elephant, then it goes in the elephant box. (Appears above the elephant box.)	E reads screen and points to elephant box; then E touches and holds button to advance to next screen.
1B: Screen 4 – Live trial 1	Here is an elephant. Where does it go?	E reads screen. C touches a box.
1B: Screen 5 – Rule reminder 2	Elephants go here. (Appears above the elephant box.)	E reads screen, points to elephant box and then E touches and holds button to continue.

DCCS Developmental Extension (DEXT) Phase 1 (Elephant/Fish)		
	iPad screen written content	**Examiner (E) & Child (C) Actions**
1B: Screen 6 – Live trial 2	Here is an elephant. Where does it go?	E reads screen. C touches a box.
1B: Screen 7 – Rule reminder 3	If it's an elephant, then it goes in the elephant box. (Appears above the elephant box.)	E reads screen and points to elephant box; then E touches and holds button to advance to next screen.
1B: Screen 8 – Live trial 3	Here is an elephant. Where does it go?	E reads screen. C touches a box.
1B: Screen 9 – Rule reminder 4	Elephants go here. (Appears above the elephant box.)	E reads screen and points to elephant box; then E touches and holds button to advance to next screen.
1B: Screen 10 – Live Trial 4	Here is an elephant. Where does it go?	E reads screen. C touches a box.
1B: Screen 11 – Rule reminder 5	If it's an elephant, then it goes in the elephant box. (Appears above the elephant box.)	E reads screen and points to elephant box; then E touches and holds button to advance to next screen.
1B: Screen 12 – Live Trial 5	Here is an elephant. Where does it go?	E reads screen. C touches a box.
If less than 4 of 5 correct, the test is discontinued. If 4 or more correct, the test continues to DEXT Phase 2.		

	DCCS Developmental Extension (DEXT) Phase 2 (Big Kitty/Little Kitty)	
	iPad screen written content	**Examiner (E) & Child (C) Actions**
2A: Screen 1 – Instruction	Now, we're going to play a different game. Here I have a little kitty and a big kitty. Look at these boxes down here. This one has a little kitty in it, and this one has a big kitty in it. I'm going to put the little kitties in the little kitty box. And I'm going to put the big kitties in the big kitty box.	E reads screen and points out the relevant aspects. After 10 seconds, Touch and Hold Here to Continue button appears. Then E touches and holds button to continue.
2A: Screen 2 – Demonstration	Here is a big kitty. It goes in the big kitty box.	E reads screen and touches the big kitty box, which makes a clicking sound. Touch and Hold Here to Continue button appears; then E touches and holds button to continue.
2A: Screen 3 – Demonstration	Here is a little kitty. It goes in the little kitty box.	E reads screen and touches the little kitty box, which makes a clicking sound. Touch and Hold Here to Continue button appears; then E touches and holds button to continue.
2A: Screen 4 – Instruction	Now, it's going to be your turn. Put the little kitties in the little kitty box and the big kitties in the big kitty box.	E reads screen, then touches and holds the button to continue.
2A: Screen 5 – Rule check	Can you show me where the little kitties go?	E reads screen. C touches a box.
2A: Screens 6a & 6b – Feedback	6a (If correct) Very good, that's right.	E reads screen. Touch and Hold Here to Continue button appears. Then E touches and holds button to continue.
	6b (If incorrect) Uh oh. Remember, in this game, the big kitties go in the big kitty box, and the little kitties go in the little kitty box.	Touch and Hold Here to Continue button appears; after E touches and holds button, screen says: **Can you show me where the little kitties go?** E reads screen and C touches a box, triggering either 6a or 6b.
		Touch and Hold Here to Continue button appears again, E touches and holds button to continue.

	DCCS Developmental Extension (DEXT) Phase 2 (Big Kitty/Little Kitty)	
	iPad screen written content	**Examiner (E) & Child (C) Actions**
2A: Screen 7 – Rule check	Can you show me where the big kitties go?	E reads screen. C touches a box.
2A: Screens 8a & 8b – Feedback	8a (If correct) Very good, that's right.	E reads screen. Touch and Hold Here to Continue button appears. E touches and holds button to continue to next screen.
	8b (If incorrect) Uh oh. Remember, in this game, the big kitties go in the big kitty box, and the little kitties go in the little kitty box.	Touch and Hold Here to Continue button appears; after E touches and holds button, screen says: **Can you show me where the big kitties go?** E reads screen and C touches a box, triggering either 8a or 8b.
		When Touch and Hold Here to Continue button appears again, E touches and holds button to continue.
2A: Screen 9 – Transition	OK, let's put all the kitties in their boxes.	E reads screen. Touch and Hold Here to Continue button appears, then E touches and holds button to continue.
2A: Screen 10 – Rule reminder 1	If it's a little kitty, then it goes in the little kitty box. If it's a big kitty, then it goes in the big kitty box. (Text appears above relevant boxes.)	E reads screen. After 5, seconds, Touch and Hold Here to Continue button appears. Then E touches and holds button to move to next screen.
2A: Screen 11 – Live Trial 1	Here is a little kitty. Where does it go?	E reads screen. C touches a box.
2A: Screen 12 – Rule reminder 2	Little kitties go here. Big kitties go here. (Text appears above relevant boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. Then E touches and holds button to advance to next screen.
2A: Screen 13 – Live Trial 2	Here is a big kitty. Where does it go?	E reads screen. C touches a box.
2A: Screen 14 – Rule reminder 3	If it's a little kitty, then it goes in the little kitty box. If it's a big kitty, then it goes in the big kitty box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. Then E touches and holds button to continue.

	DCCS Developmental Extension (DEXT) Phase 2 (Big Kitty/Little Kitty)	
	iPad screen written content	**Examiner (E) & Child (C) Actions**
2A: Screen 15 – Live Trial 3	Here is a little kitty. Where does it go?	E reads screen. C touches a box.
2A: Screen 16 – Rule reminder 4	Little kitties go here. Big kitties go here. (Text appears above relevant boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
2A: Screen 17 – Live trial 4	Here is a big kitty. Where does it go?	E reads screen. C touches a box.
2A: Screen 18 – Rule reminder 5	If it's a little kitty, then it goes in the little kitty box. If it's a big kitty, then it goes in the big kitty box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
2A: Screen 19 – Live Trial 5	Here is a big kitty. Where does it go?	E reads screen. C touches a box.
If less than 4 of 5 correct, DEXT Phase 2 is discontinued (If DEXT started at Phase 2, Phase 1A items are presented; depending on performance on Phase 1A items, Phase 1B items may be presented as well. Then the test is discontinued). If 4 or more correct, test continues to Phase 2B.		
2B: Screen 1 – Instructions	OK, now let's play a silly game. Let's put all the big kitties in the little kitty box and put all the little kitties in the big kitty box. This is a silly game.	E reads screen. After 7 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
2B: Screen 2 – Instructions	Let's try this silly game!	E reads screen. After 1 second, Touch and Hold Here to Continue button appears. Then E touches and holds button to advance to next screen.
2B: Screen 3 – Rule reminder 1	If it's a little kitty, then it goes in the big kitty box. If it's a big kitty, then it goes in the little kitty box (Text appears above reversed boxes.)	E read screens. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
2B: Screen 4 – Live trial 1	Here is a little kitty. Where does it go?	E reads screen. C touches a box.
2B: Screen 5 – Rule reminder 2	Little kitties go here. Big kitties go here. (Text appears above reversed boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.

	DCCS Developmental Extension (DEXT) Phase 2 (Big Kitty/Little Kitty)	
	iPad screen written content	**Examiner (E) & Child (C) Actions**
2B: Screen 6 – Live trial 2	Here is a big kitty. Where does it go?	E reads screen. C touches a box.
2B: Screen 7 – Rule reminder 3	If it's a little kitty, then it goes in the big kitty box. If it's a big kitty, then it goes in the little kitty box (Text appears above reversed boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to advance to next screen.
2B: Screen 8 – Live trial 3	Here is a little kitty. Where does it go?	E reads screen. C touches a box.
2B: Screen 9 – Rule reminder 4	Little kitties go here. Big kitties go here. (Text appears above reversed boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. Then E touches and holds button to advance to next screen.
2B: Screen 10 – Live Trial 4	Here is a little kitty. Where does it go?	E reads screen. C touches a box.
2B: Screen 11 – Rule reminder 5	If it's a little kitty, then it goes in the big kitty box. If it's a big kitty, then it goes in the little kitty box (Text appears above reversed boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. Then E touches and holds button to advance to next screen.
2B: Screen 12 – Live Trial 5	Here is a big kitty. Where does it go?	E reads screen. C touches a box.
If less than 4 of 5 correct, DEXT Phase 2 is discontinued (If DEXT started at Phase 2, Phase 1A items are presented; depending on performance on Phase 1A items, Phase 1B items may be presented as well. Then the test is discontinued). No Phase is administered more than once. If 4 or more correct, the test continues to DEXT Phase 3.		

DCCS Developmental Extension (DEXT) Phase 3 (Separated shape and color)		
	iPad screen written content	**Examiner (E) & Child (C) Actions**
3A: Screen 1 – Instructions	Now we're going to play another game. Here is a flower and here is a heart. This is the shape game. In the shape game, all the flowers go in the flower box, And all the hearts go in the heart box.	E reads screen and points out the relevant aspects. After 10 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
3A: Screen 2 – Instruction	See, here is a heart. It goes in the heart box.	E reads screen and touches the heart box, which makes a clicking sound. Touch and Hold Here to Continue button appears; E touches and holds the button to continue.
3A: Screen 3 – Instruction	And here is a flower. It goes in the flower box.	E reads screen and touches the flower box, which makes a clicking sound. Touch and Hold Here to Continue button appears; E touches and holds the button to continue
3A: Screen 4 – Rule check	Can you show me where the hearts go in the shape game?	E reads screen. C touches a box.
3A: Screens 5a & b – Feedback	5a (If correct) Very good, that's right.	E reads screen. Touch and Hold Here to Continue button appears. E touches and holds button to advance to next screen.
	5b (If incorrect) Uh oh. Remember, in the shape game, hearts go in the heart box and flowers go in the flower box.	Touch and Hold Here to Continue button appears; after E touches and holds button, screen says: **Can you show me where the hearts go?** E reads screen and C touches a box, triggering either 5a or b.
		When Touch and Hold Here to Continue button appears again, E touches and holds button to advance to next screen.
3A: Screen 6 – Rule check	Can you show me where the flowers go in the shape game?	E reads screen. C touches a box.
3A: Screens 7a & b – Feedback	5a (If correct) Very good, that's right.	E reads screen. Touch and Hold Here to Continue button appears. E touches and holds button to advance to next screen.

DCCS Developmental Extension (DEXT) Phase 3 (Separated shape and color)		
	iPad screen written content	**Examiner (E) & Child (C) Actions**
	5b (If incorrect) Uh oh. Remember, in the shape game, hearts go in the heart box and flowers go in the flower box.	Touch and Hold Here to Continue button appears; after E touches and holds button, screen says: **Can you show me where the flowers go?** E reads screen and C touches a box, triggering either 5a or b.
		When Touch and Hold Here to Continue button appears again, E touches and holds button to advance to next screen.
3A: Screens 8 – Transition	Now let's do more like that!	E reads screen. When Touch and Hold Here to Continue button appears, E touches and holds button to continue.
3A: Screen 9 – Rule reminder 1	If it's a flower, then it goes in the flower box. If it's a heart, then it goes in the heart box. (Text appears above relevant boxes.)	E reads screen. After 5, seconds, Touch and Hold Here to Continue button appears. Then E touches and holds button to advance to next screen.
3A: Screen 10 – Live Trial 1	Here is a flower. Where does it go?	E reads screen. C touches a box.
3A: Screen 11 – Rule reminder 2	Flowers go here. Hearts go here. (Text appears above relevant boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
3A: Screen 12 – Live Trial 2	Here is a heart. Where does it go?	E reads screen. C touches a box.
3A: Screen 13 – Rule reminder 3	If it's a flower, then it goes in the flower box. If it's a heart, then it goes in the heart box. (Text appears above relevant boxes.)	E reads screen. After 5, seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
3A: Screen 14 – Live Trial 3	Here is a flower. Where does it go?	E reads screen. C touches a box.
3A: Screen 15 – Rule reminder 4	Flowers go here. Hearts go here. (Text appears above relevant boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.

DCCS Developmental Extension (DEXT) Phase 3 (Separated shape and color)		
	iPad screen written content	**Examiner (E) & Child (C) Actions**
3A: Screen 16 – Live trial 4	Here is a flower. Where does it go?	E reads screen. C touches a box.
3A: Screen 17 – Rule reminder 5	If it's a flower, then it goes in the flower box. If it's a heart, then it goes in the heart box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
3A: Screen 18 – Live Trial 5	Here is a heart. Where does it go?	E reads screen. C touches a box.
If less than 4 of 5 correct, DEXT Phase 3 is discontinued (If DEXT started at Phase 3, DEXT Phase 2A items are presented and depending on performance on Phase 2A items, DEXT 2B OR DEXT 1A is presented. When either or both (depending on performance) Phase 2A and 2B are administered, the test ends. When either or both (depending one performance) Phase 1A and 1B items are administered, the test ends). No Phase is administered more than once. If 4 or more correct on DEXT Phase 3A, the test continues to Phase 3B.		
3B: Screen 1 – Instructions	Now we're going to play a new game. We're not going to play the shape game anymore. We're going to play the color game. In the color game, all the pink ones go in the pink box. All the yellow ones go in the yellow box.	E reads screen. After 10 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to advance to next screen.
3B: Screen 2 – Instructions	Let's try this game!	E reads screen. After 1 second, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
3B: Screen 3 – Rule reminder 1	If it's a pink one, then it goes in the pink box. If it's a yellow one, then it goes in the yellow box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
3B: Screen 4 – Live trial 1	Here's a yellow one. Where does it go?	E reads screen. C touches a box.
3B: Screen 5 – Rule reminder 2	If it's a pink one, then it goes in the pink box. If it's a yellow one, then it goes in the yellow box. (Text appears above relevant boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
3B: Screen 6 – Live trial 2	Here's a pink one. Where does it go?	E reads screen. C touches a box.
3B: Screen 7 – Rule reminder 3	If it's a pink one, then it goes in the pink box. If it's a yellow one, then it goes in the yellow box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.

DCCS Developmental Extension (DEXT) Phase 3 (Separated shape and color)		
	iPad screen written content	**Examiner (E) & Child (C) Actions**
3B: Screen 8 – Live trial 3	Here's a pink one. Where does it go?	E reads screen. C touches a box.
3B: Screen 9 – Rule reminder 4	If it's a pink one, then it goes in the pink box. If it's a yellow one, then it goes in the yellow box. (Text appears above relevant boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
3B: Screen 10 – Live Trial 4	Here's a yellow one. Where does it go?	E reads screen. C touches a box.
3B: Screen 11 – Rule reminder 5	If it's a pink one, then it goes in the pink box. If it's a yellow one, then it goes in the yellow box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
3B: Screen 12 – Live Trial 5	Here's a yellow one. Where does it go?	E reads screen. C touches a box.
If less than 4 of 5 correct, DEXT Phase 3 is discontinued (If DEXT started at Phase 3, DEXT Phase 2A items are presented; depending on performance on Phase 2A items, Phase 2B or Phase 1A is presented. When either or both (depending on performance) Phase 2A and 2B are administered, the test ends; or, when either or both (depending on performance) Phase 1A and 1B items are administered, the test ends). No Phase is administered more than once. If 4 or more correct, test continues to DEXT Phase 4.		

Developmental Extension (DEXT) Phase 4 (Integrated color and shape) DCCS		
	iPad screen written content	**Examiner (E) & Child (C) Actions**
4A: Screen 1 – Instructions	Now we're going to play the color game with different pictures. In this color game, all the red ones go in the red box. And all the blue ones go in the blue box.	E reads screen and points out the relevant aspects. After 8 seconds, Touch and Hold Here to Continue button appears. E touches and holds the button to continue.
4A: Screen 2 – Demonstration	Here is a red one. It goes in the red box.	E reads screen and touches the red box, which makes a clicking sound. Touch and Hold Here to Continue button appears; E touches and holds the button to continue.
4A: Screen 3 – Demonstration	Here is a blue one. It goes in the blue box.	E reads screen and touches the blue box, which makes a clicking sound. Touch and Hold Here to Continue button appears; E touches and holds the button to continue
4A: Screen 4 – Rule check	Can you show me where the blue ones go in the color game?	E reads screen. C touches a box.
4A: Screens 5a & b – Feedback	5a (If correct) Very good, that's right.	E reads screen. Touch and Hold Here to Continue button appears. E touches and holds button to advance to next screen.
	5b (If incorrect) Uh oh. Remember, in the color game, if it's a blue one, then put it in the blue box, but if it's a red one, put it in the red box.	Touch and Hold Here to Continue button appears; after E touches and holds button, screen says: **Can you show me where the blue ones go?** E reads screen and C touches a box, triggering either 5a or b.
		When Touch and Hold Here to Continue button appears again, E touches and holds button to advance to next screen.
4A: Screen 6 – Rule check	Can you show me where the blue ones go in the color game?	E reads screen. C touches a box.
4A: Screens 7a & b – Feedback	5a (If correct) Very good, that's right.	E reads screen. Touch and Hold Here to Continue button appears. E touches and holds button to advance to next screen.
	5b (If incorrect) Uh oh. Remember, in the color game, if it's a blue one, then put it in the blue box, but if it's a red one, put it in the red box.	Touch and Hold Here to Continue button appears; after E touches and holds button, screen says: **Can you show me where the red ones go?** E reads screen and C touches a box, triggering either 5a or b.
		When Touch and Hold Here to Continue button appears again, E touches and holds button to advance to next screen.

4A: Screens 8 – Transition	Now let's do some more like that!	E reads screen. When Touch and Hold Here to Continue button appears, E touches and holds button to continue.
4A: Screen 9 – Rule reminder 1	If it's a red one, then it goes in the red box. If it's a blue one, then it goes in the blue box. (Text appears above relevant boxes.)	E reads screen. After 5, seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
4A: Screen 10 – Live Trial 1	Here is a red one. Where does it go?	E reads screen. C touches a box.
4A: Screen 11 – Rule reminder 2	Red ones go here. Blue ones go here. (Text appears above relevant boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
4A: Screen 12 – Live Trial 2	Here is a blue one. Where does it go?	E reads screen. C touches a box.
4A: Screen 13 – Rule reminder 3	If it's a red one, then it goes in the red box. If it's a blue one, then it goes in the blue box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
4A: Screen 14 – Live Trial 3	Here is a blue one. Where does it go?	E reads screen. C touches a box.
4A: Screen 15 – Rule reminder 4	Red ones go here. Blue ones go here. (text above relevant boxes)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
4A: Screen 16 – Live trial 4	Here is a red one. Where does it go?	E reads screen. C touches a box.
4A: Screen 17 – Rule reminder 5	If it's a red one, then it goes in the red box. If it's a blue one, then it goes in the blue box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
4A: Screen 18 – Live Trial 5	Here is a red one. Where does it go?	E reads screen. C touches a box.
If less than 4 of 5 correct, the test is discontinued. If 4 or more correct, the test continues to Phase 4B.		
4B: Screen 1 – Instructions	Now we're going to play a different game. We're not going to play the color game anymore. We're going to play the shape game. In the shape game, all the stars go in the star box. All the airplanes go in the airplane box.	E reads screen. After 10 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to advance to next screen.
4B: Screen 2 – Transition	Let's try this game!	E reads screen. After 1 second, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
4B: Screen 3 – Rule reminder 1	If it's an airplane, then it goes in the airplane box. If it's a star, then it goes in the star box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
4B: Screen 4 – Live trial 1	Here is an airplane. Where does it go?	E reads screen. C touches a box.

4B: Screen 5 – Rule reminder 2	Airplanes go here. Stars go here (Text appears above relevant boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
4B: Screen 6 – Live trial 2	Here is a star. Where does it go?	E reads screen. C touches a box.
4B: Screen 7 – Rule reminder 3	If it's an airplane, then it goes in the airplane box. If it's a star, then it goes in the star box. (Text appears above relevant boxes.)	E reads screen After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
4B: Screen 8 – Live trial 3	Here is an airplane. Where does it go?	E reads screen. C touches a box.
4B: Screen 9 – Rule reminder 4	Airplanes go here. Stars go here (text above boxes)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
4B: Screen 10 – Live Trial 4	Here is an airplane. Where does it go?	E reads screen. C touches a box.
4B: Screen 11 – Rule reminder 5	If it's an airplane, then it goes in the airplane box. If it's a star, then it goes in the star box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
4B: Screen 12 – Live Trial 5	Here is a star. Where does it go?	E reads screen. C touches a box.
DEXT Phase 4 is complete. End of DCCS.		

C.2.4.3 Dimensional Change Card Sort Test Instructions Ages 8-11

This table outlines the item content read by as well as the actions for the examiner.

	iPad screen written content	Examiner (E) Actions
Title Screen	NIH Toolbox DCCS 8-11	E touches and holds button to continue
Home Base Intro	We're going to play a matching game with colors and shapes. But first we are going to learn about Home Base. This is your Home Base. Put your finger on the Home Base and wait for the next picture.	Reads screen and points to Home Base; then touches and holds button to continue.
SHAPE intro	We'll play the SHAPE game first. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E points to BOAT, then demonstrates use of button.
	If it's a RABBIT, choose that picture.	E points to RABBIT, then touches and holds button to continue.
Transition	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
Shape Practice Set 1	4 items sorted by shape	
More practice, if less than 3 out of 4 correct on Set 1	Let's practice that some more. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E chooses BOAT.
	If it's a RABBIT, choose that picture.	E chooses RABBIT.
Transition	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.

	iPad screen written content	Examiner (E) Actions
Shape Practice Set 2	4 items sorted by shape	
More practice, if less than 3 out of 4 correct on Set 2	Let's practice that some more. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E chooses BOAT.
	If it's a RABBIT, choose that picture.	E chooses RABBIT.
Transition	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
Shape Practice Set 3	4 items sorted by shape	
Test ends, if less than 3 out of 4 correct on Set 3		
COLOR intro	We can also match by COLOR. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's BROWN, choose this picture.	E points to, then chooses, BROWN picture.
	If it's WHITE, choose that picture.	E points to, then chooses, WHITE picture.
Transition	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
Color Practice Set 1	4 items sorted by color	
More practice, if less than 3 out of 4 correct on Set 1	Let's practice some more. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's WHITE, choose this picture.	E chooses WHITE picture.

	iPad screen written content	Examiner (E) Actions
	If it's BROWN, choose that picture.	E chooses BROWN picture.
Transition	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
Color Practice Set 2	4 items sorted by color	
More practice, if less than 3 out of 4 correct on Set 2	Let's practice some more. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's WHITE, choose this picture.	E chooses WHITE picture.
	If it's BROWN, choose that picture.	E chooses BROWN picture.
Transition	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
Color Practice Set 3	4 items sorted by color	
Test ends, if less than 3 out of 4 correct on Set 3		
Test item intro	Now we're going to play both games together. Remember, if you see and hear the word SHAPE, you choose the picture that's the same SHAPE as the picture in the middle of the screen. If you see and hear the word COLOR, you choose the picture that's the same COLOR as the picture in the middle of the screen. Remember, put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
Transition	Now you try.	E reads screen, then touches and holds button to continue.

	iPad screen written content	Examiner (E) Actions
	Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	
Test items	30 mixed items	

C.2.4.4 Dimensional Change Card Sort Test Instructions Ages 12+

This table outlines the item content read by as well as the actions for the examiner.

	iPad screen written content	Examiner (E) Actions
Title Screen	NIH Toolbox DCCS 12+	E touches and holds button to continue
Home Base Intro	We're going to play a matching game with colors and shapes. But first we are going to learn about Home Base. This is your Home Base. Put your finger on the Home Base and wait for the next picture.	E reads screen and points to Home Base; then touches and holds button to continue.
SHAPE intro	We'll play the SHAPE game first. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E points to BOAT, then demonstrates use of button.
	If it's a RABBIT, choose that picture.	E points to RABBIT, then touches and holds button to continue.
Transition	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
Shape Practice set 1	4 items sorted by shape	
More practice, if less than 3 out of 4 correct on set 1	Let's practice that some more. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E chooses BOAT.
	If it's a RABBIT, choose that picture.	E chooses RABBIT.
Shape Practice set 2	4 items sorted by shape	
More practice, if less than 3 out of 4	Let's practice that some more. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E chooses BOAT.

	iPad screen written content	Examiner (E) Actions
correct on set 2		
	If it's a RABBIT, choose that picture.	E chooses RABBIT.
Shape Practice set 3	4 items sorted by shape	
Test ends, if less than 3 out of 4 correct on set 3		
COLOR intro	We can also match by COLOR. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's BROWN, choose this picture.	E points to, then chooses, BROWN picture.
	If it's WHITE, choose that picture.	E points to, then chooses, WHITE picture.
Transition	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
Color Practice set 1	4 items sorted by color	
More practice, if less than 3 out of 4 correct on set 1	Let's practice some more. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's WHITE, choose this picture.	E chooses WHITE picture.
	If it's BROWN, choose that picture.	E chooses BROWN picture.
Transition	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
Color Practice set 2	4 items sorted by color	
More practice, if less than 3 out of 4 correct on set 2	Let's practice some more. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's WHITE, choose this picture.	E chooses WHITE picture.
	If it's BROWN, choose that picture.	E chooses BROWN picture.
Transition	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
Color Practice set 3	4 items sorted by color	
Test ends, if less than 3 out of 4 correct on set 3		

	iPad screen written content	Examiner (E) Actions
Test item intro	Now we're going to play both games together. Remember, if you see the word SHAPE, you choose the picture that is the same SHAPE as the picture in the middle of the screen. If you see the word COLOR, you choose the picture that is the same COLOR as the picture in the middle of the screen. Remember, put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
Transition	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going. Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
Test items	30 mixed items	

C.2.5 NIH Toolbox Pattern Comparison Processing Speed Test

The NIH Toolbox Pattern Comparison Processing Speed Test is designed to measure processing speed. The test itself takes less than 90 seconds and requires participants to discern whether two side-by-side pictures are the same or not.

Younger children make this decision by choosing either a “smiley face” (corresponding to a “yes” response) or a “frowny face” (corresponding to a “no” response). Older children and adults (Ages 7+) make this decision with “yes” or “no” buttons on the screen

Equipment needed:

- iPad
- Small ball (optional)

Practice Items:

Young children are administered two demonstration items and five practice items; older children and adults are administered six practice items.

All participants touch the buttons that matches their choice: “smiley face” or “yes” for same or look alike or “frowny face” or “no” for not the same or do not look alike. The practice items are not timed. If a participant (child or adult) continues to make an error after being corrected on two practice items, the test will discontinue.

For both test and practice items, if there is no response in 10 seconds, the pre-recorded audio asks: **Are these the same?**

During practice items only, an audio recording will follow each item presentation:

If the item is correct, an audio recording will say: **That’s right.**

If the item is incorrect, an audio recording will say why the item is incorrect. The item will appear a second time and the participant will be asked to respond again.

If a participant (child or adult) continues to make an error after being corrected two times on two different practice items, the test will discontinue.

Test items:

There are a maximum of 130 items or a maximum response time of 85 seconds.

Prompts:

Some participants need reminders to stay on task. The examiner may give prompts, although fewer are better as this is a timed task. Each prompt should be succinct.

Examples are: look at the screen; are these the same, yes or no; remember to choose a button; remember to choose as quickly as you can.

Handedness: If this was not entered during registration, the iPad app will not allow this test to be administered. Instead, the examiner will need to ask a set of questions to ascertain handedness and to enter it in the participant registration screen. Please refer to Appendix 2 for details.

Once handedness is entered in the participant registration screen, it will automatically update the instructions on the test so that "RIGHT" or "LEFT" is displayed where appropriate

IMPORTANT REMINDER: Unlike some of the other tasks, if participants have difficulty touching the screen, the examiner **cannot** answer for them, as this task measures processing speed and having the examiner answer would compromise the accuracy of this measurement.

Participants may be given a small stress ball to keep in their non-dominant hand.

Age-specific test instructions:

NIH Toolbox Pattern Comparison Processing Speed Test Instructions Ages 3-6

NIH Toolbox Pattern Comparison Processing Speed Test Instructions Ages 7+

C.2.5.1 Pattern Comparison Processing Speed Test Instructions Ages 3-6

The task is introduced with the Title Screen: NIH Toolbox PC 3-6. At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the test.

Handedness: If this was not entered during registration, the iPad app will not allow this test to be administered. Instead, the examiner will need to ask a set of questions to ascertain handedness and to enter it in the participant registration screen. Please refer to Appendix 2 for details.

Once handedness is entered in the participant registration screen, it will automatically update the instructions on the test so that "RIGHT" or "LEFT" is displayed where appropriate

Read the screen: **I would like you to use the pointer** (index) **finger of this** (point to dominant right or left as appropriate) **hand to answer.**

Let's look at these two faces. One of them is a SMILEY face and the other is a FROWN face (point to each).

Touch and hold button that says: **Touch and hold here to continue.**

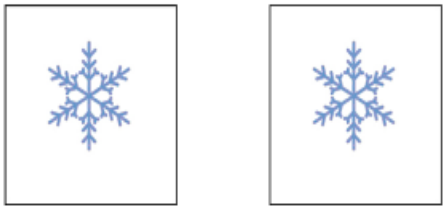
Read the screen: **Now I am going to show you some pictures. On each screen, there will be two pictures. Sometimes the pictures look alike or the same, and sometimes the pictures do not look alike and are NOT the same.**

When the pictures look alike or the same, you should choose the SMILEY face. When they do NOT look alike or the same, you should choose the FROWN face.

Touch and hold button that says: **Touch and hold here to continue.**

Ages 3-6 Practice Item 1:

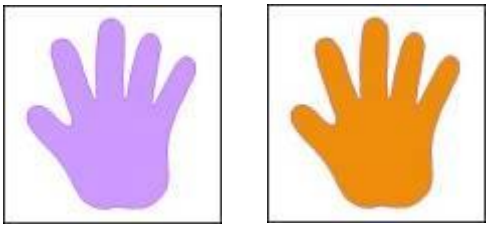
Read the screen: **Look at the boxes on the screen; in them are two pictures: this picture** (point to left box) **and this picture** (point to right box). **These two pictures look alike or the same, so we'll choose the SMILEY face. Let's choose the SMILEY face together.**



Audio recording says: **Great job!** when the SMILEY face is touched. Next item will appear.

Ages 3-6 Practice Item 2:

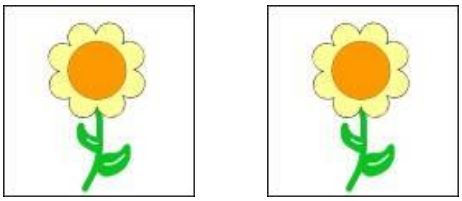
Read the screen: **Look at these pictures here. This picture** (point) **and this picture** (point) **do NOT look alike or the same. This picture** (point) **is purple but this picture** (point) **is orange. This means the pictures are NOT alike, so we'll choose the FROWN face. Let's choose the FROWN face together and then you will do some practice.**



Audio recording says: **Great job!** when FROWN face is touched. Next item will appear.

Ages 3-6 Practice Item 3:

Audio recording says: **Are these the same? Remember, touch the SMILEY face if they look alike or are the same and touch the FROWN face if they do not look alike and are NOT the same.** Pictures will stay on screen, until there is a response and audio recording will repeat: **Are these the same?**



If correct (**SMILEY face**), the audio recording says: **Great job!** Next item will appear.

If incorrect **(FROWN face),** the audio recording says: **The pictures look alike, the same. Both pictures are flowers that are the same size and color, so choose the SMILEY face.** SMILEY face will flash; item will stay on screen.

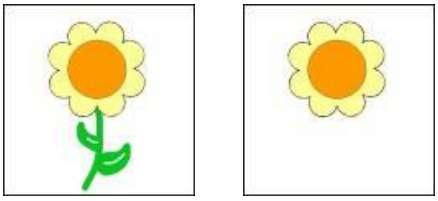
If no response, the audio recording repeats: **Are these the same?**

If child chooses correctly, the audio recording will say: **Great job!** Next item will appear.

If child chooses incorrectly another time, iPad program moves to next practice item after repeating explanation above.

Ages 3-6 Practice Item 4:

Audio recording says: **Are these the same?** Pictures will stay on screen, until there is a response and audio recording will repeat: **Are these the same?**



If correct (**FROWN face**), the audio recording says: **Great job!** Next item will appear.

If incorrect **(SMILEY face)**, the audio recording says: **These pictures do not look alike and are NOT the same. One picture is a flower with a stem and one picture is only the top of a flower, with no stem. Choose the FROWN face. FROWN face** will flash; item will stay on screen.

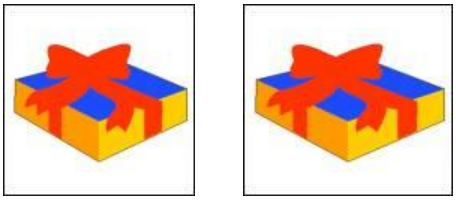
If no response, the audio recording repeats: **Are these the same?**

If child chooses correctly, the audio recording will say: **Great job!** Next item will appear.

If child chooses incorrectly another time, iPad program moves to next practice item after repeating explanation above.

Ages 3-6 Practice Item 5:

Audio recording says: **Are these the same?** Pictures will stay on screen, until there is a response and audio recording will repeat: **Are these the same?**



If correct (**SMILEY face**), the audio recording says: **Great job!** Next item will appear.

If incorrect **(FROWN face),** the audio recording says: **These pictures look alike, the same. Both are pictures of a present or gift box, so choose the SMILEY face. SMILEY face** will flash; item will stay on screen.

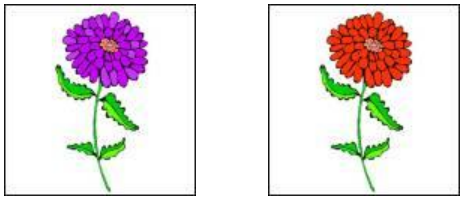
If no response, the audio recording repeats: **Are these the same?**

If child chooses correctly, the audio recording will say: **Great job!** Next item will appear.

If child chooses incorrectly another time, iPad program moves to next practice item after repeating explanation above.

Ages 3-6 Practice Item 6:

Audio recording says: **Are these the same?** Pictures will stay on screen, until there is a response and audio recording will repeat: **Are these the same?**



If correct (**FROWN face**), the audio recording says: **Great job!** Next item will appear.

If incorrect **(SMILEY face),** the audio recording says: **These pictures do not look alike and are NOT the same. One flower is purple and the other flower is red; so choose the FROWN face. FROWN face** will flash; item will stay on screen.

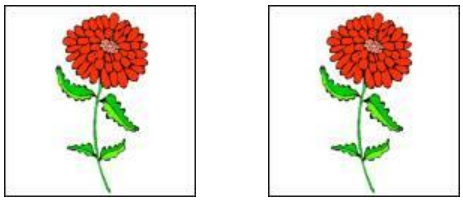
If no response, the audio recording repeats: **Are these the same?**

If child chooses correctly, the audio recording will say: **Great job!** Next item will appear.

If child chooses incorrectly another time, iPad program moves to next practice item after repeating explanation above.

Ages 3-6 Practice Item 7:

Audio recording says: **Are these the same?** Pictures will stay on screen, until there is a response and audio recording will repeat: **Are these the same?**



If correct (**SMILEY face**), the audio recording says: **Great job!** Practice items are complete.

If incorrect **(FROWN face),** the audio recording says: **These pictures look alike. Both are pictures of red flowers, so choose the SMILEY face. SMILEY face** will flash; item will stay on screen.

If no response, the audio recording repeats: **Are these the same?**

If child chooses correctly, the audio recording will say: **Great job!** Next item will appear.

If child chooses incorrectly another time, iPad program moves to next practice item after repeating explanation above.

Test Items:

NOTE: If the child has not correctly chosen the SMILEY or FROWN face after two trials on two practice items 3-7, testing will automatically be discontinued and iPad will move on to the next test.

Test Items:

Read the screen: **Now you'll do some more. Remember, touch the SMILEY face if the pictures look alike or are the same and touch the FROWN face if they do not look alike and are NOT the same. Make a choice as quickly as you can. Are you ready?**

When ready, touch and hold button that says: **Touch and hold here to continue.**

For both test and practice items, if participant does not respond within 10 seconds, audio recording asks: **Are these the same?**

When either 130 items appear or 85 seconds of testing time has occurred, the test will end (if a participant is working on an item when time is up, he/she will be permitted to complete it).

C.2.5.2 Pattern Comparison Processing Speed Test Instructions Ages 7+

The task is introduced with the Title Screen: NIH Toolbox PC 7+. At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the test.

Handedness: If this was not entered during registration, the iPad app will not allow this test to be administered. Instead, the examiner will need to ask a set of questions to ascertain handedness and to enter it in the participant registration screen. Please refer to Appendix 2 for details.

Once handedness is entered in the participant registration screen, it will automatically update the instructions on the test so that "RIGHT" or "LEFT" is displayed where appropriate

An audio recording says:

On each screen, you are going to see two pictures. Sometimes the two pictures are the same and sometimes the two pictures are NOT the same. If the pictures look the same, touch the 'Yes' button. If they do NOT look the same, touch the NO button. If you make a mistake during the practice, you will hear a message to try again. Use your _____ (dominant hand from handedness, audio will say "right" or "left") **index finger to respond. Let's try some for practice.**

When the audio recording is complete, **Touch and hold here to continue** appears on the screen. Touch and hold that button to begin the administration.

Practice Items:

There are 6 practice items. The first practice item is introduced with an audio recording asking: **Are these the same? Remember, touch YES if they look alike or are the same and touch NO if they do not look alike and are NOT the same.**

For the other five practice items, an audio recording asks: **Are these the same?**

If the participant answers correctly, an audio recording says: ***That's right!*** The next item will appear.

If the participant answers incorrectly, an audio recording explains why the answer is wrong. The correct answer will flash; item will stay on screen. If participant chooses correctly, an audio recording will say: ***That's right!*** and the next item will appear.

If the participant chooses incorrectly another time, the program automatically moves to the next practice item after repeating the explanation above.

Practice item	Correct response	Incorrect response
1	Yes: both yellow flowers	No
2	No: a flower with stem & top of a flower	Yes
3	No: one present & many presents	Yes
4	Yes: both single presents	No
5	No: purple flower & red flower	Yes
6	Yes: both red flowers	No

NOTE: If a participant makes an error a second time after being corrected on two different practice items, the test will discontinue.

Test Items:

An audio recording introduces the test items: **Now we'll do some more. Remember, use your _____** (right/left; audio will say the dominant one) **index finger to respond. Touch YES if the pictures look the same and touch NO if they do NOT look the same. It is important that you choose as quickly as you can.**

When the audio file is complete, **Touch and hold here to continue** appears on the screen. Touch and hold that button to continue with the test items.

For both test and practice items, if the participant does not respond within 10 seconds, the audio asks: **Are these the same?**

When either 130 items appear or 85 seconds of testing time has occurred, the test will end (if a participant is working on an item when time is up, he/she will be permitted to complete it).

C.2.6 NIH Toolbox Picture Sequence Memory Test

In this measure of episodic memory, sequences of pictured objects and activities are presented in a particular order. The participants are asked to reproduce the sequence of pictures that is shown on the screen.

Equipment and materials needed:

- iPad

There are three different sets (forms) of test items for this measure: forms A, B, and C. Each form has different test items that yield equivalent scores and can be used in a repeated measures research design to minimize practice effects. The forms are typically given in alphabetical order but may be given in any order as indicated by the user.

There are also different practice sequences and test items for participants of different ages: 3-4, 5-6, 7 and 8+. For each age group, there is the option to use one of the three forms: A, B, or C.

Special Instructions:

For all participants, a demonstration sequence shows participants how to move the pictures on the screen. After this, there are practice sequences that differ for participants of differing ages: 3-4, 5-6, 7 and 8+ years. In addition, the test sequences differ in length for participants of differing ages.

Participants respond by dragging pictures from the yellow box on the screen into the gray boxes on the screen. They may verbalize the picture labels as they move the pictures. If, however, verbalizing the picture labels seems to interfere with the participant's performance, the examiner should **say**: "You don't need to say the words/labels." If participants indicate that saying the labels helps them, the examiner may reassure them that they may say the labels if they wish.

If participants look away from the screen while the pictures are being presented, the examiner should **remind them to**: Watch the screen. Additionally, examiners should not allow participants to touch the screen while the pictures are being presented. If participants try to touch the screen while pictures are being presented or while the examiner is giving instructions, **say**: "Do not touch the screen until I tell you that it is your turn."

If necessary, **remind participants to**: Wait until I tell you it is your turn (to touch the screen).

If the participant has difficulty dragging the pictures across the screen during the demonstration sequence, practice sequences, or the actual test sequences, he/she may point and the examiner should move the pictures in the way the participant indicates. The examiner should ensure the participant completely understands how the process will work and should say something like the following to the participant: You point to the picture you want to move, then point to the grey box where you want to move it. I'll move it there for you**.**

Age-specific test instructions:

NIH Toolbox Picture Sequence Memory Test Ages 3-4
NIH Toolbox Picture Sequence Memory Test Ages 5-6
NIH Toolbox Picture Sequence Memory Test Age 7
NIH Toolbox Picture Sequence Memory Test Ages 8+

C.2.6.1 Picture Sequence Memory Test Instructions Ages 3-4

If the child has difficulty dragging the pictures across the screen, during the demonstration sequence, practice sequences, or the actual test sequences, he/she may point and the examiner will move the pictures in the way the child indicates. The examiner should ensure the child completely understands how the process will work and can **say something like the following:** You point to the picture you want to move, then point to the gray box where you want to move it. I'll move it there for you**.**

The test begins with a Title Screen: NIH Toolbox PSM 3-4 Form (A, B, or C). At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the test.

On the next screen, read the text: **Now we are going to play a memory game, but first I am going to teach you how to move the pictures on this screen.** When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***.

The next screen begins the three-step demonstration sequence. If the steps are not followed, the ***Touch and Hold Here to Continue*** button will not be active.

Step 1: Moving Pictures from the Yellow Box to the Gray Boxes
Read the text above the yellow box on the screen and demonstrate the actions described.

Say: **Here you see some pictures in a yellow box. I want to show you how to move the pictures to the gray boxes. You can move pictures from this yellow box to the gray boxes, like this. Touch on the picture in the yellow box; then drag the picture you touched to the gray box where you want to move it. Now you try with this picture.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***.

Step 2: Moving Pictures from the Gray Boxes to the Yellow Box
Read the text above the yellow box on the screen and demonstrate the actions described.

Say: **You can also move pictures from the gray boxes back to the yellow box, like this. Touch the picture you want to move. Then drag that picture to the yellow box. Now you move the other picture back to the yellow box.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***.

Step 3: Moving Pictures between the Gray Boxes

Read the text above the yellow box on the screen and demonstrate the actions described.

Say: **You can also move the pictures from one gray box to another, like this. First, you touch the picture in one gray box. Then, drag that picture to the gray box where you want the picture to go. Now you try it; move the picture from here to here.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***.

Introduction to the Practice Items

Read the screen: **Now, we're going to play the game. You will see some pictures on the screen. You should remember them and show them back to me in the same way you saw them on the screen.**

When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***.

The next screen begins the practice sequences. There are two practice sequences. If the child does not succeed after two trials on first practice sequence of two pictures, the test is discontinued. The second practice sequence has three pictures; if the child succeeds in four or fewer trials, the test sequence is started. If the child does not succeed on the second practice sequence after four trials, the test is discontinued.

Practice Sequence 1**:**

Say: **Now, you will see how to Eat Ice Cream.** When finished reading, touch and hold the button at the bottom of the screen that says ***Touch and Hold here to Continue***.
As the pictures are presented, an audio recording will say appropriate labels:

First, put a scoop on the cone. **Then, eat the ice cream.**

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Eat Ice Cream. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **"Are you finished?"** Ask this of the child.

If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Logic:

1. If child gives correct response: Practice sequence 2, Have a Birthday Party, will be presented.
2. If child gives incorrect response: Eat Ice Cream will be presented again with an audio recording that says**:** Let's try that again

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Eat Ice Cream. Now, you move the pictures in the same way you saw them on the screen**. The examiner may have to explain that the child made a mistake on the first trial.

If child fails both trials of Practice Sequence 1, test will discontinue.

Practice Sequence 2**:**

Say: **That's right. Now, you will see how to have a Birthday Party.** When finished reading, touch and hold the button at the bottom of the screen that says ***Touch and Hold Here to Continue****.*

As the pictures are presented, an audio recording will say appropriate labels:

First, bake the cake. **Next, frost it.** **And last, put on the candles.**

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to have a Birthday Party. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **"Are you finished?"** Ask this of the child.

If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Logic:

1. If child gives correct response, Test Item will be presented.
2. If child gives incorrect response, Have a Birthday Party will be presented again with an audio recording saying, "Let's try that again." After the pictures are presented and as the pictures are scrambled, an audio recording will say: That's how to Have a Birthday Party. Now, you move the pictures in the same way you saw them on the screen.
3. If child gives incorrect response again, #2 above is repeated up to two additional times (or a total of 4 trials).
4. If child fails all 4 trials, test will discontinue.

Test Sequences:

Children ages 3-4 are presented with two trials of a 6-step sequence.
Read the screen: **Now we are going to play the game with more pictures. This time you will see how to Play in the Park** (Form A)**; Go to the Fair** (Form B)**; Work on the Farm** (Form C)**.**

When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue****.*

Test Item (Trial 1):

As the pictures are presented, an audio recording will say appropriate labels:

Form A: Play in the Park	Form B: Go to the Fair	Form C: Work on the farm
• Open a picnic basket • Lay out the blanket • Sit on the blanket • Put a coin in the duck food machine • Get the duck food • Feed the ducks	• Take the pony out of the barn • Put the saddle on the pony • Go for a pony ride • Put the hot dog in a bun • Spread mustard on the hot dog • Eat the hot dog	• Dig a hole • Plant the tomatoes • Water the tomatoes • Put up a fence • Get some paint • Paint the fence

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Play in the Park** (Form A)**; Go to the Fair** (Form B)**; Work on the Farm** (Form C)**. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **"Are you finished?"** Ask this of the child. If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Read the screen: **Now you will see again how to Play in the Park (**or **Go to the Fair** or **Work on the Farm**). **Everyone has to do this more than once.**

When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***.

Test Item (Trial 2):

As the pictures are presented, an audio recording will say appropriate labels (same as Trial 1; see above).

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Play in the Park (**or **Go to the Fair** or **Work on the Farm**).**Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **"Are you finished?"** Ask this of the child. If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Logic:

Test will terminate after the two test sequences have been presented**.**

C.2.6.2 Picture Sequence Memory Test Instructions Ages 5-6

If the child has difficulty dragging the pictures across the screen, during the demonstration sequence, practice sequences, or the actual test sequences, he/she may point and the examiner will move the pictures in the way the child indicates. The examiner should ensure the child completely understands how the process will work and can **say something like the following:** You point to the picture you want to move, then point to the gray box where you want to move it. I'll move it there for you**.**

The test begins with a Title Screen: NIH Toolbox PSM 5-6 Form A, B or C. At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the test.

On the next screen, read the text: **Now we are going to play a memory game, but first I am going to teach you how to move the pictures on this screen.** When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***.

The next screen begins the three-step demonstration sequence. If the steps are not followed, the Touch and Hold Here to Continue button will not be active.

Step 1: Moving Pictures from the Yellow Box to the Gray Boxes
Read the text above the yellow box on the screen and demonstrate the actions described.

Say: **Here you see some pictures in a yellow box. I want to show you how to move the pictures to the gray boxes. You can move pictures from this yellow box to the gray boxes, like this. Touch on the picture in the yellow box; then drag the picture you touched to the gray box where you want to move it. Now you try with this picture.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***.

Step 2: Moving Pictures from the Gray Boxes to the Yellow Box
Read the text above the yellow box on the screen and demonstrate the actions described.

Say: **You can also move pictures from the gray boxes back to the yellow box, like this. Touch the picture you want to move. Then drag that picture to the yellow box. Now you move the other picture back to the yellow box.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***.

Step 3: Moving Pictures between the Gray Boxes
Read the text above the yellow box on the screen and demonstrate the actions described.

Say: **You can also move the pictures from one gray box to another, like this. First, you touch the picture in one gray box. Then, drag that picture to the gray box where you want the picture to go. Now you try it; move the picture from here to here.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***.

Introduction to the Practice Items

Read the screen: **Now, we're going to play the game. You will see some pictures on the screen. You should remember them and show them back to me in the same way you saw them on the screen.**

When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***.

The next screen begins the practice sequences. There are two practice sequences. The child has four trials to complete each sequence. If the child succeeds in four trials or less, the next practice sequence or test sequence is presented. If the child fails all four trials of either practice sequence, the test is discontinued.

Practice Sequence 1:

Say**: Now, you will see how to Have a Birthday Party.** When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***.
As pictures are presented, an audio recording will say the appropriate labels:

First, bake the cake. **Next, frost it.** **And last, put on the candles.**

After the pictures are presented and as the pictures are scrambled, an audio recording will say**: That's how to Have a Birthday Party. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **"Are you finished?"** Ask this of the child. If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Logic:

1. If child gives correct response, Practice sequence 2, Go Camping, will be presented.
2. If child gives incorrect response, Have a Birthday Party will be presented again with an audio recording saying Let's try that again. After the pictures are presented and as the pictures are scrambled, an audio recording will say: That's how to Have a Birthday Party. Now, you move the pictures in the same way you saw them on the screen.
3. If child gives incorrect response again, #2 above is repeated up to two additional times (or a total of 4 trials).
4. If child fails all 4 trials, test will discontinue.

Practice Sequence 2**:**

Say: **That's right. Now, you will see how to Go Camping.** When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue****.*
As pictures are presented, an audio recording will say the appropriate labels:

First, put up the tent.
Then, go for a hike.
Then, catch a fish.
And last, roast a marshmallow.

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Go Camping. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **"Are you finished?"** Ask this of the child. If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Logic:

1. If child gives correct response, Test Item will be presented.
2. If child gives incorrect response, Go Camping will be repeated with an audio recording saying, Let's try that again. After the pictures are presented and as the pictures are scrambled, an audio recording will say: That's how to Go Camping. Now, you move the pictures in the same way you saw them on the screen.
3. If child gives incorrect response again, #2 above is repeated up to two additional times (or a total of 4 trials).
4. If child fails all 4 trials, test will discontinue.

Test Sequences:

Children ages 5-6 will be presented with two trials of a 9-step sequence.
Read the screen: **Now we are going to play the game with more pictures. This time you will see how to Play in the Park** (Form A)**; Go to the Fair** (Form B)**; Work on the Farm** (Form C)**.** When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue****.*

Test Item (Trial1): As the pictures are presented, an audio recording will say appropriate labels:

Form A: Play in the park	Form B: Go to the fair	Form C: Work on the farm
• Fly a kite • Play in the sand • Go down the slide • Pull the wagon • Draw on the side walk • Pet the dog • Feed the ducks • Push the swing • Smell a flower	• Get a hot dog • Go for a pony ride • Pet the sheep • Win a dog show • Go on a ride • Get some tickets • Get some ice cream • Play a game • Milk a cow	• Put the cow in the barn • Drive the tractor • Feed the pig • Load the cart • Peel the corn • Chop some wood • Collect the eggs • Put the blanket on the horse • Plant the tomatoes

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Play in the Park** (Form A)**; Go to the Fair** (Form B)**; Work on the Farm** (Form C)**. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **"Are you finished?"** Ask this of the child. If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Read the screen: **Now you will see again how to how to Play in the Park** (Form A)**; Go to the Fair** (Form B)**; Work on the Farm** (Form C)**. Everyone has to do this more than once.** When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue.***

Test Item (Trial 2): As the pictures are presented, an audio recording will say appropriate labels (same as Trial 1; see above).

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Play in the Park** (Form A)**; Go to the Fair** (Form B)**; Work on the Farm** (Form C)**. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **"Are you finished?"** Ask this of the child. If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Logic:

Test will terminate after the two test sequences have been presented**.**

C.2.6.3 ***Picture Sequence Memory Test Instructions Age 7***

If the child has difficulty dragging the pictures across the screen, during the demonstration sequence, practice sequences, or the actual test sequences, he/she may point and the examiner will move the pictures in the way the child indicates. The examiner should ensure the child completely understands how the process will work and can **say something like the following:** You point to the picture you want to move, then point to the gray box where you want to move it. I'll move it there for you**.**

The test begins with a Title Screen: NIH Toolbox PSM 7 Form A, B or C. At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the test.

On the next screen, read the text: **Now we are going to play a memory game, but first I am going to teach you how to move the pictures on this screen.**

When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue****.*

The next screen begins the three-step demonstration sequence. If the steps are not followed, the Touch and Hold Here to Continue button will not be active.

Step 1: Moving Pictures from the Yellow Box to the Gray Boxes
Read the text above the yellow box on the screen and demonstrate the actions described.

Say: **Here you see some pictures in a yellow box. I want to show you how to move the pictures to the gray boxes. You can move pictures from this yellow box to the gray boxes, like this. Touch on the picture in the yellow box; then drag the picture you touched to the gray box where you want to move it. Now you try with this picture.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue****.*

Step 2: Moving Pictures from the Gray Boxes to the Yellow Box
Read the text above the yellow box on the screen and demonstrate the actions described.

Say: **You can also move pictures from the gray boxes back to the yellow box, like this. Touch the picture you want to move. Then drag that picture to the yellow box. Now you move the other picture back to the yellow box.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue****.*

Step 3: Moving Pictures between the Gray Boxes

Read the text above the yellow box on the screen and demonstrate the actions described.

Say: **You can also move the pictures from one gray box to another, like this. First, you touch the picture in one gray box. Then, drag that picture to the gray box where you want the picture to go. Now you try it; move the picture from here to here.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue****.*

Introduction to the Practice Items

Read the screen: **Now, we're going to play the game. You will see some pictures on the screen. You should remember them and show them back to me in the same way you saw them on the screen.**

When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue****.*

The next screen begins the two practice sequences. The child has four trials to complete each sequence. If the child succeeds in four trials or less, the next practice sequence or test sequence is presented. If the child fails all four trials of either practice sequence, the test is discontinued.

Practice Sequence 1:

Say: **Now, you will see how to Have a Birthday Party.** When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue****.*

As pictures are presented, an audio recording will say the appropriate labels:

First, bake the cake. **Next, frost it.** **And last, put on the candles.**

After the pictures are presented and as the pictures are scrambled, an audio recording will say**: That's how to Have a Birthday Party. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **"Are you finished?"** Ask this of the child.

If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Logic:

1. If child gives correct response, Practice sequence 2, Go Camping, will be presented.
2. If child gives incorrect response, Have a Birthday Party will be presented again with an audio recording saying Let's try that again. After the pictures are presented and as the pictures are scrambled, an audio recording will say: That's how to Have a Birthday Party. Now, you move the pictures in the same way you saw them on the screen.
3. If child gives incorrect response again, #2 above is repeated up to two additional times (or a total of 4 trials).

4. If child fails all 4 trials, test will discontinue.

Practice Sequence 2**:**

Say: **That's right. Now, you will see how to Go Camping.** When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue****.*
As pictures are presented, an audio recording will say the appropriate labels:

First, put up the tent.
Then, go for a hike.
Then, catch a fish.
And last, roast a marshmallow.

After the pictures are presented and as the pictures are scrambled, an audio recording will say**: That's how to Go Camping. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **"Are you finished?"** Ask this of the child.

If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

If child gives correct response, Test Items will be presented.

If child gives incorrect response, Go Camping will be repeated with an audio recording saying Let's try that again. After the pictures are presented and as the pictures are scrambled, an audio recording will say: That's how to Go Camping. Now, you move the pictures in the same way you saw them on the screen.

Logic:

1. If child gives incorrect response again, #2 above is repeated up to two additional times (or a total of 4 trials).
2. If child fails all 4 trials, test will discontinue.

Test Sequences:

Children age 7 will be presented with two test trials: one with a 15-step sequence and the other with an 18-step sequence.

Read the screen: **Now we are going to play the game with more pictures. This time you will see how to Play in the Park** (Form A)**; Go to the Fair** (Form B)**; Work on the Farm** (Form C)**.**

When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue****.*
Test Item (Trial1):

As the pictures are presented, an audio recording will say appropriate labels:

Form A: Play in the park	Form B: Go to the fair	Form C: Work on the farm
• Fly a kite • Play in the sand • Go down the slide • Pull the wagon • Swing on the monkey bars • Lay out the blanket • Play catch • Catch a butterfly • Kick the ball • Take the baby for a walk • Draw on the sidewalk • Pet the dog • Feed the ducks • Push the swing • Smell a flower	• Get a hot dog • Go for a pony ride • Pet the sheep • Win a dog show • Watch the rodeo • Catch a pig • Judge the cake • See a puppet theater • Take a picture of a clown • Look at the babies • Go on a ride • Get some tickets • Get some ice cream • Play a game • Milk a cow	• Put the cow in the barn • Drive the tractor • Feed the pig • Load the cart • Put the carrots in the basket • Pick the fruit • Fix the fence • Cut the sheep's wool • Collect the honey • Shovel out the barn • Peel the corn • Chop some wood • Collect the eggs • Put the blanket on the horse • Plant the tomatoes

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Play in the Park** (Form A)**; Go to the Fair** (Form B)**; Work on the Farm** (Form C)**. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **"Are you finished?"** Ask this of the child. If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Read the screen**: Now we're going to do the same pictures with some more pictures added. Everyone is asked to do this more than once.** When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue.***

Test Item (Trial 2):

As the pictures are presented, an audio recording will say appropriate labels:

Form A: Play in the park	Form B: Go to the fair	Form C: Work on the farm
• Fly a kite • Play in the sand • Go down the slide • Pull the wagon • Swing on the monkey bars • Lay out the blanket • Play catch • Catch a butterfly • Ride a bike • Row the boat • Read a book • Kick the ball • Take the baby for a walk • Draw on the sidewalk • Pet the dog • Feed the ducks • Push the swing • Smell a flower	• Get a hot dog • Go for a pony ride • Pet the sheep • Win a dog show • Watch the rodeo • Catch a pig • Judge the cake • See a puppet theater • Watch a tractor pull • Play in the band • Go on a hay ride • Take a picture of a clown • Look at the babies • Go on a ride • Get some tickets • Get some ice cream • Play a game • Milk a cow	• Put the cow in the barn • Drive the tractor • Feed the pig • Load the cart • Put the carrots in the basket • Pick the fruit • Fix the fence • Cut the sheep's wool • Cut the wheat • Herd the goats • Put up the scarecrow • Collect the honey • Shovel out the barn • Peel the corn • Chop some wood • Collect the eggs • Put the blanket on the horse • Plant the tomatoes

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to how to Play in the Park** (Form A)**; Go to the Fair** (Form B)**; Work on the Farm** (Form C)**. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **"Are you finished?"** Ask this of the child. If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Logic:

Test will terminate after the two test sequences have been presented.

C.2.6.4 Picture Sequence Memory Test Instructions Age 8+

If the participant has difficulty dragging the pictures across the screen, during the demonstration sequence, practice sequences, or the actual test sequences, he/she may point and the examiner will move the pictures in the way the participant indicates. The examiner should ensure the participant completely understands how the process will work and can **say something like the following:** You point to the picture you want to move, then point to the gray box where you want to move it. I'll move it there for you**.**

The test begins with a Title Screen: NIH Toolbox PSM 8+ Form A, B or C. At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the test.

On the next screen, read the text: **Now we are going to play a memory game, but first I am going to teach you how to move the pictures on this screen.**

When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***.

The next screen begins the three-step demonstration sequence. If the steps are not followed, the Touch and Hold Here to Continue button will not be active.

Step 1: Moving Pictures from the Yellow Box to the Gray Boxes
Read the text above the yellow box on the screen and demonstrate the actions described.
Say: **Here you see some pictures in a yellow box. I want to show you how to move the pictures to the gray boxes. You can move pictures from this yellow box to the gray boxes, like this. Touch on the picture in the yellow box; then drag the picture you touched to the gray box where you want to move it. Now you try with this picture.**

After the participant demonstrates understanding of this step, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***.

Step 2: Moving Pictures from the Gray Boxes to the Yellow Box
Read the text above the yellow box on the screen and demonstrate the actions described.

Say: **You can also move pictures from the gray boxes back to the yellow box, like this. Touch the picture you want to move. Then drag that picture to the yellow box. Now you move the other picture back to the yellow box.**

After the participant demonstrates understanding of this step, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***.

Step 3: Moving Pictures between the Gray Boxes

Read the text above the yellow box on the screen and demonstrate the actions described.

Say: **You can also move the pictures from one gray box to another, like this. First, you touch the picture in one gray box. Then, drag that picture to the gray box where you want the picture to go. Now you try it; move the picture from here to here.**

After the participant demonstrates understanding of this step, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue****.*

Introduction to the Practice Items

Read the screen: **Now, we're going to play the game. You will see some pictures on the screen. You should remember them and show them back to me in the same way you saw them on the screen.**

When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue****.*

The next screen begins the one practice sequence for these ages. The participant has four trials to complete the sequence. If the participant succeeds in four trials or less, the test sequences are presented.

If the participant fails all four trials of the practice sequence, the test is discontinued.

Practice Sequence**:**

Say: **Now, you will see how to Go Camping.** When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue****.*
As pictures are presented, an audio recording will say the appropriate labels:

First, put up the tent.
Then, go for a hike.
Then, catch a fish.
And last, roast a marshmallow.

After the pictures are presented and as the pictures are scrambled, an audio recording will say**: That's how to Go Camping. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **"Are you finished?"** Ask this of the participant.

If participant says YES, touch and hold the YES button. If the participant says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Logic:

1. If participant gives correct response, Test Item will be presented.
2. If participant gives incorrect response, Go Camping will be repeated with an audio recording saying Let's try that again. After the pictures are presented and as the pictures are scrambled, an audio recording will say: That's how to Go Camping. Now, you move the pictures in the same way you saw them on the screen.
3. If participant gives incorrect response again, #2 above is repeated up to two additional times (or a total of 4 trials).
4. If participant fails all 4 trials, test will discontinue.

Test Sequences:

Participants ages 8+ will be presented with two trials: one with a 15-step sequence and the other with an 18-step sequence.

Read the screen: **Now we are going to play the game with more pictures. This time you will see how to Play in the Park** (Form A)**; Go to the Fair** (Form B)**; Work on the Farm** (Form C)**.**

When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue****.*

Test Item (Trial1): As the pictures are presented, an audio recording will say appropriate labels:

Form A: Play in the park	Form B: Go to the fair	Form C: Work on the farm
• Fly a kite • Play in the sand • Go down the slide • Pull the wagon • Swing on the monkey bars • Lay out the blanket • Play catch • Catch a butterfly • Kick the ball • Take the baby for a walk • Draw on the sidewalk • Pet the dog • Feed the ducks • Push the swing • Smell a flower	• Get a hot dog • Go for a pony ride • Pet the sheep • Win a dog show • Watch the rodeo • Catch a pig • Judge the cake • See a puppet theater • Take a picture of a clown • Look at the babies • Go on a ride • Get some tickets • Get some ice cream • Play a game • Milk a cow	• Put the cow in the barn • Drive the tractor • Feed the pig • Load the cart • Put the carrots in the basket • Pick the fruit • Fix the fence • Cut the sheep's wool • Collect the honey • Shovel out the barn • Peel the corn • Chop some wood • Collect the eggs • Put the blanket on the horse • Plant the tomatoes

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Play in the Park** (Form A)**; Go to the Fair** (Form B)**; Work on the Farm** (Form C)**. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **"Are you finished?"** Ask this of the participant. If participant says YES, touch and hold the YES button. If the participant says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Read the screen**: Now we're going to do the same pictures with some more pictures added. Everyone is asked to do this more than once.** When finished reading, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue.***

Test Item (Trial 2): As the pictures are presented, an audio recording will say appropriate labels:

Form A: Play in the park	Form B: Go to the fair	Form C: Work on the farm
• Fly a kite • Play in the sand • Go down the slide • Pull the wagon • Swing on the monkey bars • Lay out the blanket • Play catch • Catch a butterfly • Ride a bike • Row the boat • Read a book • Kick the ball • Take the baby for a walk • Draw on the sidewalk • Pet the dog • Feed the ducks • Push the swing • Smell a flower	• Get a hot dog • Go for a pony ride • Pet the sheep • Win a dog show • Watch the rodeo • Catch a pig • Judge the cake • See a puppet theater • Watch a tractor pull • Play in the band • Go on a hay ride • Take a picture of a clown • Look at the babies • Go on a ride • Get some tickets • Get some ice cream • Play a game • Milk a cow	• Put the cow in the barn • Drive the tractor • Feed the pig • Load the cart • Put the carrots in the basket • Pick the fruit • Fix the fence • Cut the sheep's wool • Cut the wheat • Herd the goats • Put up the scarecrow • Collect the honey • Shovel out the barn • Peel the corn • Chop some wood • Collect the eggs • Put the blanket on the horse • Plant the tomatoes

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Play in the park** (Form A)**; Go to the fair** (Form B)**; Work on the farm** (Form C)**.**

Now, you move the pictures in the same way you saw them on the screen. When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **"Are you finished?"** Ask this of the participant. If participant says YES, touch and hold the YES button. If the participant says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Logic:

Test will terminate after the two test sequences have been presented**.**

C.2.7 NIH Toolbox Oral Reading Recognition Test

The NIH Toolbox Oral Reading Recognition Test is a measure of reading decoding skills. These skills are part of what are considered crystalized abilities, abilities that are dependent on past learning and exposure to other cultural experiences. To accomplish this, the iPad is paired with a wireless keyboard on which the examiner indicates whether the participant's response is correct or not.

Equipment and materials needed:

- iPad
- Bluetooth wireless keyboard
- Pronunciation guide

Detailed information on equipment and materials needed for all tests can be found in Appendix 4.

Setting up Bluetooth Wireless Keyboard:

- Go to the **Settings** app of the iPad and make sure Bluetooth is turned on.
- Make sure the keyboard is in discovery mode by pressing the round button at the top right end of the keyboard and the small green light to the left of the button begins flashing.
- Select the keyboard when it appears on the My Devices list on the iPad.
- When a pop up window appears on the iPad screen, follow the instructions and enter the required code on the keyboard.

The usual keyboard on the iPad will not work when the external keyboard is working. To turn off the external keyboard, press the round button at the top right end of the keyboard, move at least 15 meters from the iPad with the keyboard, or touch the "information" button ⓘ on the iPad and touch "forget this device."

Using the Keyboard

Once the participant pronounces a letter or word, the examiner checks a pronunciation key and types **1** if the pronunciation is correct or **0** if the response is incorrect. After choosing **1** or **0**, the examiner presses the spacebar to move on to the next word or letter.

The Left arrow takes the participant back to the previous item.

Ctrl + Shift on the Keyboard is equivalent to the gesture used to STOP an administration on the iPad. Like the iPad, when Ctrl + Shift is entered on the keyboard, a login screen will pop up and ask for the password of the user who started the assessment. As described earlier, three options will appear: resume, skip, and stop.

In this task, the participant is asked to read and pronounce letters and words as accurately as possible. For the youngest children, the initial items may require them to identify the letters in an array with three symbols or to identify a specific letter in an array of four letters. In such cases, an audio file will play, instructing the participant to point out the answer on the iPad screen; the examiner will score the item accordingly using the keyboard, as with all other items. The administration is individualized using a computerized adaptive (CAT) format. This task is intended for participants 7 years and older, although it can be administered to children as young as age 3, as appropriate.

The test uses age (for participants younger than 18) and education (for participants age 18 and older) to determine which items it initially presents. There is an override in the participant information screen. If an examiner feels that a participant should begin the test at a level higher or lower than that determined by his/her education and age, the examiner should use this feature. One set of instructions is used for all participants.

Each participant will see a series of letters and words presented one at a time on the computer screen. Items are presented in order of difficulty – the computer adjusts the difficulty level of items depending on the participant's performance. The number of items presented will depend on age and performance; for most participants, the measure will last approximately 3 minutes and will contain about 25 items. The computer will administer each item one by one, in an untimed fashion, until the test is completed.

The measure cannot be self-administered; an examiner must record whether each response is correct.

After the participant pronounces a letter or word, the examiner checks a pronunciation key as needed and types 1 if the pronunciation is correct or 0 if the response is incorrect. After choosing 1 or 0, the examiner presses the spacebar to move on to the next word or letter. The examiner can go back and change one prior answer by touching the left arrow on the keyboard and choosing a new answer and then touching the spacebar to activate the next item.

Testing is automatically discontinued if a participant makes seven consecutive errors.

Note: It is essential that the examiner thoroughly review and master the pronunciation guide before administering this test. The examiner should not rely on his/her understanding of word pronunciations based on previous experience. Instead, the examiner must adhere to this guide for all item scoring. At the same time, while scoring is strict, it should take into consideration difficulties in pronunciation that can be attributed to dialect or articulation; to the extent that these difficulties are consistent throughout the testing, they should be accepted as correct pronunciations by the examiner.

C.2.7.1 ***Oral Reading Recognition Test Instructions Age 3+***

Before beginning the test, the wireless keyboard should be paired by Bluetooth with the iPad, if this has not already been done. While administering this measure, the examiner needs to be able to view the iPad and have the keyboard and word list and pronunciation guide easily accessible for scoring participant responses.

The task is introduced with the Title Screen: NIH Toolbox OR 3+.

To check the Bluetooth connection, the examiner is asked at the bottom of the page to: ***Press Spacebar to Continue.*** Touching the **spacebar** begins the test. If the spacebar does not work, try re-pairing the keyboard or changing the batteries in the keyboard.

Say: **Now I'm going to show you some letters and some words. I want you to read each letter or word out loud. Read each one loud enough so that I can hear you. Some will be easy and some will be hard. Don't worry if you don't know the word or its meaning – just read it out loud the best you can. Let's begin.**

Press **spacebar** to continue.

When the first item appears, say: **Tell me, what is this letter/word?** (Say whichever is appropriate. This prompt can be repeated as many times as needed.)

After participant answers, the examiner checks a pronunciation guide as needed and types **1** if the participant's pronunciation is correct or **0** if the response is incorrect.

After choosing **1** or **0**, the examiner **presses the spacebar** to move on to the next word or letter. Pressing the spacebar registers the choice in the scoring program; until the spacebar is pressed, the examiner may change his/her choice without having to go back.

If the participant says: I don't know this one or I can't read it, say: **It is OK if you don't know the word or what it means – just try to read it as best you can.** This prompt can be used to reassure participants if they refuse to read the letters/words. If, after prompting, a participant refuses to offer a response, mark the item incorrect (**0**) and press the **spacebar** to move on to the next item.

NOTE: The examiner can go back one previous item to change an answer if the participant self-corrects or the examiner realizes a scoring error was made. To do this, press the left arrow on the keyboard, then press **1** or **0** to indicate the score for the item to be corrected item. Then, press the **spacebar** and the next item will be presented (this may or may not be the same word/letter seen before the left arrow was pressed).

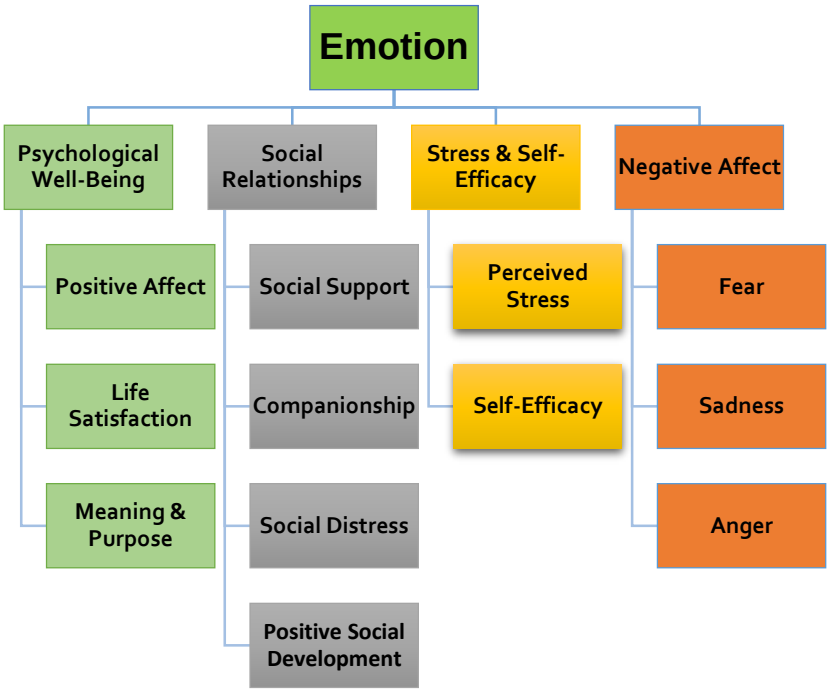
NOTE: For the youngest children, the initial items may require them to identify the letters in an array with three symbols or to identify a specific letter in an array of four letters. In such cases, an audio file will play, instructing the participant to point out the answer on the iPad screen; the examiner will score the item accordingly using the keyboard, as with all other items.

C.3 Emotion Domain

Emotion refers to any strong feeling, as of joy, sorrow, or fear. Emotion is an affective state of consciousness in which joy, sorrow, fear, hate, or the like is experienced, as distinguished from cognitive and volitional states of consciousness. Emotions can be negative and distressing, or positive emotions can be reflections of well-being in our lives, and positive social relationships can buffer stress and enhance health.

Emotion Domain Framework

NIH Toolbox Emotion consists of four subdomains: *Psychological Well Being, Social Relationships, Stress & Self Efficacy,* and *Negative Affect*. Each subdomain includes narrower constructs that are measured through appropriate versioned surveys for Adults (over 18); ages 13-17; ages 8-12 (self and parent-report) and ages 3-7 (parent-report only).



Psychological Well-Being (PWB) includes both **hedonic** and **eudaimonic** components. **Hedonic constructs** are more subjective and experiential and emphasize pleasure and positive affect (happiness, serenity, and cognitive engagement). **Eudaimonic well-being** is more evaluative and emphasizes fulfillment and purpose (e.g., meaning, life satisfaction).

Social Relationships refers to the interactions between two or more people. Dimensions of social relationships include structure, extent and quality.

Stress & Self-Efficacy describes individual perceptions about the nature of events and their relationship to the perceived coping resources of an individual.

Negative Affect refers to unpleasant feelings or emotions, which exist on a continuum ranging from common and normal feelings of sadness, fear, and anger to more extreme feelings along the same continuum.

C.3.1 Emotion Constructs

NIH Toolbox Emotion constructs are defined below.

Psychological Well-Being	Definition
Positive Affect	Feelings that reflect a level of pleasurable engagement with the environment such as happiness, joy, excitement, enthusiasm, and contentment.
General Life Satisfaction	One's cognitive evaluation of life experiences; whether people like their lives or not. Life satisfaction includes both general (e.g., my life is going well) and domain-specific (e.g., I am satisfied with my family life) aspects.
Meaning and Purpose	Characterized by the extent to which people feel their life matters or makes sense.
Social Relationships	**Definition**
Social Support	The extent to which an individual views his/her social relationships as available to provide aid in times of need or when problems arise. It includes instrumental and emotional social support. *Emotional Support:* perception that people in one's social network are available to listen to one's problems with empathy, caring and understanding. *Instrumental Support*: perception that people in one's social network are available to provide material or functional aid in completing daily tasks.
Companionship	Characterized by self-reported perceptions of the availability of friends or companions with whom to interact or affiliate (i.e., friendship) and perceptions that one is alone, lonely or socially isolated (i.e., loneliness).
Social Distress	The extent to which an individual perceives his/her daily interactions as negative or distressing.
Positive Social Development	Characterized by parents' evaluation of their children's empathic behaviors.
Stress & Self Efficacy	**Definition**
Perceived Stress	Individual perceptions about the nature of events and their relationship to the values and coping resources of an individual.
Self-Efficacy	A person's belief in their capacity to manage their functioning and have control over meaningful events.
Negative Affect	**Definitions**
Fear	Characterized by symptoms of anxiety that reflect autonomic arousal and perceptions of threat.
Sadness	Distinguished by low levels of positive affect and comprised of symptoms that are primarily affective (poor mood) and cognitive (negative perceptions of self, the world, and the future) indicators of depression.
Anger	Characterized by attitudes of hostility and cynicism and is often associated with experiences of frustration impeding goal-directed behavior.

Emotion Measure Formats

Each emotion measure is administered in either a computerized adaptive testing (CAT) or fixed form (FF) format:

CATs – Emotion CATs begin with a standard item (specific to that measure) and then select items to administer based on a respondent's previous answers. An algorithm is utilized to determine which item should be administered next. NIH Toolbox instruments, which use CAT as an administration method, are often referred to as Banks. CATS are usually 4-6 items long.

Fixed Forms (FFs) - fixed length form with all items administered in a set (sequential) order.

Self- versus proxy-report

All Emotion items are presented in a *self-report* (i.e., the respondent answers questions about him/herself) or in a *proxy (parent)-report* (i.e., the respondent answers questions about someone else) format:

Pediatric self-report –measures completed by the participant, ages 8-17.
Adult self-report –measures completed by adult participants 18+ years of age.
Parent report –measures completed by parents for children ages 3-12.

Time to administer
All individual emotion measures take approximately 1-2 minutes to complete.

Emotion Batteries

The NIH Toolbox App includes 5 preset batteries: *NIH Toolbox Emotion Battery (age 18+)*, *NIH Toolbox Emotion Battery (ages 8-12), NIH Toolbox Emotion Battery (ages 13-17), NIH Toolbox Emotion Parent Report Battery (ages 3-7),* and *NIH Toolbox Emotion Parent Report Battery (ages 8-12)*

Users wishing to select specific measures or create custom batteries can find the complete list of available measures here.

NOTE There are two versions of NIH Toolbox Emotion instructions: NIH Toolbox Emotion Instructions (Adult/Child) and NIH Toolbox Emotion Instructions (Parent Report). When using individual instruments to set up an assessment or build a custom battery, users must select the correct version to precede Emotion instruments. All preset Emotion batteries include appropriate instructions.

C.3.2 General Instructions

The participant answers emotion measures at his/her own speed. An examiner need not be involved. After a question is answered, the screen advances automatically to the next question. All measures for the youngest age group (3-7) are parent (proxy) report measures. On these measures, the proxy (parent or guardian) responds to questions about the child according to how he/she thinks the child is doing.

For 8-12 year old children, measures come in both self- and parent-report versions. For ages 13+, only self-report measures are available.

C.3.3 NIH Toolbox Emotion Age-Specific Instructions and Instruments

Self-report and parent-report instruments have slightly different instructions **on the screen**; these are given below:

NIH Toolbox Participant Instructions for Self-Report Measures (Children and Adults):

*"***On the next screens, we will ask you questions about your thoughts, feelings and behaviors. Read each question carefully and answer as well as you can. There is no right or wrong answer, only what is true for you and describes your thoughts, feelings, and behaviors.**

"Select an answer by touching your answer choice on the screen. After you make your choice, the computer will automatically go on to the next question. If you want to change your answer, touch the GO BACK button to return to the question, then touch a different answer choice."

A button at the bottom of the screen says**:** "***Touch and Hold Here to Continue****."*

The content and order of measures within the self-report batteries are shown in the following tables.

C.3.3.1 NIH Toolbox Emotion Battery (age 18+)

Instrument name	CAT or # of Items in Fixed Form
NIH Toolbox Emotion Instructions (Adult/Child)	--
NIH Toolbox Positive Affect CAT Age 18+ v2.0	CAT
NIH Toolbox General Life Satisfaction CAT Age 18+ v2.0	CAT
NIH Toolbox Meaning and Purpose CAT Age 18+ v2.0	CAT
NIH Toolbox Emotional Support FF Age 8+ v2.0	8
NIH Toolbox Instrumental Support FF Age 18+ v2.0	8
NIH Toolbox Friendship FF Age 8+ v2.0	8
NIH Toolbox Loneliness FF Age 8+ v2.0	5
NIH Toolbox Perceived Rejection FF Age 8+v2.0	8
NIH Toolbox Perceived Hostility FF Age 8+ v2.0	8
NIH Toolbox Self-Efficacy CAT Age 18+ v2.0	CAT
NIH Toolbox Perceived Stress FF Age 18+ v2.0	10
NIH Toolbox Fear-Affect CAT Age 18+ v2.0	CAT
NIH Toolbox Fear-Somatic Arousal FF Age 18+ v2.0	6
NIH Toolbox Sadness CAT Age 18+ v2.0	CAT
NIH Toolbox Anger-Affect CAT Age 18+ v2.0	CAT
NIH Toolbox Anger-Hostility FF Age 18+ v2.0	5
NIH Toolbox Anger-Physical Aggression FF Age 18+ v2.0	5

C.3.3.2 NIH Toolbox Emotion Battery (Ages 8-12)

Instrument name	CAT or # of Items in Fixed Form
NIH Toolbox Emotion Instructions (Adult/Child)	--
NIH Toolbox Positive Affect FF Ages 8-12 v2.0	9
NIH Toolbox General Life Satisfaction FF Ages 8-12 v2.0	5
NIH Toolbox Emotional Support FF Age 8+ v2.0	7
NIH Toolbox Friendship FF Age 8+ v2.0	5
NIH Toolbox Loneliness FF Age 8+ v2.0	7
NIH Toolbox Perceived Rejection FF Age 8+ v2.0	5
NIH Toolbox Perceived Hostility FF Age 8+ v2.0	5
NIH Toolbox Self-Efficacy CAT Ages 8-12 v2.0	CAT
NIH Toolbox Anger-Affect FF Ages 8-17 v2.0	6
NIH Toolbox Sadness FF Ages 8-17 v2.0	8
NIH Toolbox Fear FF Ages 8-17 v2.0	8

C.3.3.3 NIH Toolbox Emotion Battery (Ages 13-17)

Instrument name	CAT or # of Items in Fixed Form
NIH Toolbox Emotion Instructions (Adult/Child)	--
NIH Toolbox Positive Affect CAT Ages 13-17 v2.0	CAT
NIH Toolbox General Life Satisfaction CAT Ages 13-17 v2.0	CAT
NIH Toolbox Emotional Support FF Age 8+ v2.0	7
NIH Toolbox Friendship FF Age 8+ v2.0	5
NIH Toolbox Loneliness FF Age 8+ v2.0	7
NIH Toolbox Perceived Rejection FF Age 8+ v2.0	5
NIH Toolbox Perceived Hostility FF Age 8+ v2.0	5
NIH Toolbox Self-Efficacy CAT Ages 13-17 v2.0	CAT
NIH Toolbox Perceived Stress FF Ages 13-17 v2.0	10
NIH Toolbox Anger-Affect FF Ages 8-17 v2.0	6
NIH Toolbox Sadness FF Ages 8-17 v2.0	8
NIH Toolbox Fear FF Ages 8-17 v2.0	8

NIH Toolbox Emotion Instructions (Parent Report):

"On the next screens, you will see questions about your child's feelings and behaviors. Read each question carefully and answer as best you can. Please consider each question by itself and choose an answer that you believe honestly shows how your child feels and acts.

Select an answer by touching the answer choice on the screen. After you make your choice, the computer will automatically go on to the next question. If you want to change your answer, touch the GO BACK button to return to the question, then touch a different answer choice."

A button at the bottom of the screen says**:** *"**Touch and Hold Here to Continue**."*

The content and order of measures within the parent report batteries are shown in the following tables.

C.3.3.4 NIH Toolbox Emotion Parent Report Battery (ages 3-7)

Instrument name	CAT or # of Items in Fixed Form
NIH Toolbox Emotion Instructions(Parent Report)	--
NIH Toolbox Positive Affect Parent Report CAT Ages 3-7 v2.0	CAT
NIH Toolbox General Life Satisfaction Parent Report FF Ages 3-12 v2.0	5
NIH Toolbox Positive Peer Interaction Parent Report FF Ages 3-12 v2.0	4
NIH Toolbox Social Withdrawal Parent Report FF Ages 3-12 v2.0	4
NIH Toolbox Peer Rejection Parent Report FF Ages 3-12 v2.0	9
NIH Toolbox Empathic Behaviors Parent Report CAT Ages 3-12 v2.0	CAT
NIH Toolbox Fear-Over Anxious Parent Report FF Ages 3-7 v2.0	6
NIH Toolbox Fear-Separation Anxiety Parent Report FF Ages 3-7 v2.0	7
NIH Toolbox Sadness Parent Report FF Ages 3-7 v2.0	7
NIH Toolbox Anger Parent Report FF Ages 3-7 v2.0	9

C.3.3.5 NIH Toolbox Emotion Parent Report Battery (ages 8-12)

Instrument name	CAT or # of Items in Fixed Form
NIH Toolbox Emotion Instructions (Parent Report)	--
NIH Toolbox Positive Affect Parent Report CAT Ages 8-12 v2.0	CAT
NIH Toolbox General Life Satisfaction Parent Report FF Ages 3-12 v2.0	5
NIH Toolbox Perceived Stress Parent Report CAT Ages 8-12 v2.0	CAT
NIH Toolbox Self-Efficacy Parent Report CAT Ages 8-12 v2.0	CAT
NIH Toolbox Positive Peer Interaction Parent Report FF Ages 3-12 v2.0	4
NIH Toolbox Social Withdrawal Parent Report FF Ages 3-12 v2.0	4
NIH Toolbox Peer Rejection Parent Report FF Ages 3-12 v2.0	9
NIH Toolbox Empathic Behaviors Parent Report CAT Ages 3-12 v2.0	CAT
NIH Toolbox Fear Parent Report CAT Ages 8-12 v2.0	CAT
NIH Toolbox Sadness Parent Report CAT Ages 8-12 v2.0	CAT
NIH Toolbox Anger Parent Report CAT Ages 8-12 v2.0	CAT

NOTE When using preset batteries, correct instructions will be included automatically. When using individual instruments to set up an assessment or build a custom battery, users must select the correct version to precede Emotion instruments. There are two versions of NIH Toolbox instructions: NIH Toolbox Emotion Instructions (Adult/Child) and NIH Toolbox Emotion Instructions (Parent Report).

C.3.4 Emotion measures available in the NIH Toolbox App

Subdomain	Construct	NIH Toolbox Measure	CAT/# Items in FF*
PSYCHOLOGICAL WELL-BEING	**Adult (18+) Self-Report**		
	Positive Affect	NIH Toolbox Positive Affect CAT Age 18+ v2.0	CAT
	General Life Satisfaction	NIH Toolbox General Life Satisfaction CAT Age 18+ v2.0	CAT
	Meaning & Purpose	NIH Toolbox Meaning and Purpose CAT Age 18+ v2.0	CAT
	Pediatric (13-17) Self Report		
	Positive Affect	NIH Toolbox Positive Affect CAT Ages 13-17 v2.0	CAT
	General Life Satisfaction	NIH Toolbox General Life Satisfaction CAT Ages 13-17	CAT
	Pediatric (8-12) Self Report		
	Positive Affect	NIH Toolbox Positive Affect FF Ages 8-12 v2.0	9
	General Life Satisfaction	NIH Toolbox General Life Satisfaction FF Ages 8-12	5
	Pediatric (8-12) Parent Report		
	Positive Affect	NIH Toolbox Positive Affect Parent Report CAT Ages 8-12 v2.0	CAT
	General Life Satisfaction	NIH Toolbox General Life Satisfaction Parent Report FF Ages 3-12	5
	Pediatric (3-7) Parent Report		
	Positive Affect	NIH Toolbox Positive Affect Parent Report CAT Ages 3-7 v2.0	CAT
	General Life Satisfaction	NIH Toolbox General Life Satisfaction Parent Report FF Ages 3-12	5
SOCIAL RELATIONSHIPS	**Adult (18+) Self-Report**		
	Social Support	NIH Toolbox Emotional Support FF Age 18+ v2.0	8
		NIH Toolbox Instrumental Support FF Age 18+ v2.0	8
	Companionship	NIH Toolbox Loneliness FF Age 18+ v2.0	5
		NIH Toolbox Friendship FF Age 18+ v2.0	8
	Social Distress	NIH Toolbox Perceived Hostility FF Age 18+ v2.0	8
		NIH Toolbox Perceived Rejection FF Age 18+ v2.0	8
	Pediatric (8-17) Self Report		
	Social Support	NIH Toolbox Emotional Support FF Ages 8-17 v2.0	7
	Companionship	NIH Toolbox Loneliness FF Ages 8-17 v2.0	7
		NIH Toolbox Friendship FF Ages 8-17 v2.0	5
	Social Distress	NIH Toolbox Perceived Hostility FF Ages 8-17 v2.0	5
		NIH Toolbox Perceived Rejection FF Ages 8-17 v2.0	5
	Pediatric (3-12) Parent Report		
	Companionship	NIH Toolbox Social Withdrawal Parent Report FF Ages 3-12 v2.0	4
		NIH Toolbox Positive Peer Interaction Parent Report FF Ages 3-12 v2.0	4
	Social Distress	NIH Toolbox Peer Rejection Parent Report FF Ages 3-12 v2.0	9
	Positive Social Development	NIH Toolbox Empathic Behaviors Parent Report CAT Ages 3-12 v2.0	CAT

STRESS & SELF-EFFICACY	**Adult (18+) Self-Report**		
	Perceived Stress	NIH Toolbox Perceived Stress FF Age 18+ v2.0	10
	Self-Efficacy	NIH Toolbox Self-Efficacy CAT Age 18+ v2.0	CAT
	Pediatric (13-17) Self Report		
	Perceived Stress	NIH Toolbox Perceived Stress FF Ages 13-17 v2.0	10
	Self-Efficacy	NIH Toolbox Self-Efficacy CAT Ages 13-17 v2.0	CAT
	Pediatric (8-12) Self Report		
	Self-Efficacy	NIH Toolbox Self-Efficacy CAT Ages 8-12 v2.0	CAT
	Pediatric (8-12) Parent Report		
	Perceived Stress	NIH Toolbox Perceived Stress Parent Report CAT Ages 8-12 v2.0	CAT
	Self-Efficacy	NIH Toolbox Self-Efficacy CAT Ages 8-12 v2.0	CAT
NEGATIVE AFFECT	**Adult (18+) Self-Report**		
	Anger	NIH Toolbox Anger-Affect CAT Age 18+ v2.0	CAT
		NIH Toolbox Anger-Hostility FF Age 18+ v2.0	5
		NIH Toolbox Anger-Physical Aggression FF Age 18+ v2.0	5
	Fear	NIH Toolbox Fear-Affect CAT Age 18+ v2.0	CAT
		NIH Toolbox Fear-Somatic Arousal FF Age 18+ v2.0	6
	Sadness	NIH Toolbox Sadness CAT Age 18+ v2.0	CAT
	Pediatric (8-17) Self Report		
	Anger	NIH Toolbox Anger FF Ages 8-17 v2.0	6
	Fear	NIH Toolbox Fear FF Ages 8-17 v2.0	8
	Sadness	NIH Toolbox Sadness FF Ages 8-17 v2.0	8
	Pediatric (8-12) Parent Report		
	Anger	NIH Toolbox Anger Parent Report CAT Ages 8-12 v2.0	CAT
	Fear	NIH Toolbox Fear Parent Report CAT Ages 8-12 v2.0	CAT
	Sadness	NIH Toolbox Sadness ParentReport CAT Ages 8-12 v2.0	CAT
	Pediatric (3-7) Parent Report		
	Anger	NIH Toolbox Anger Parent Report FF Ages 3-7 v2.0	9
	Fear	NIH Toolbox Fear-Over Anxious Parent Report FF Ages 3-7 v2.0	6
		NIH Toolbox Fear-Separation Anxiety Parent Report FF Ages 3-7 v2.0	7
	Sadness	NIH Toolbox Sadness Parent Report FF Ages 3-7 v2.0	7

*CATs are typically 4-6 items in length

Many NIH Toolbox Emotion Measures include items drawn from existing measures. These were used with their author's permission. Sources of items can be found on the NIH Toolbox website
http://www.nihtoolbox.org/WhatAndWhy/Emotion/Acknowledgements/Pages/default.aspx

C.4 Motor Domain

Motor function is the ability to use and control muscles and movements. Motor performance includes voluntary control of both fine and gross motor functions including dexterity, strength, balance, locomotion and endurance. Motor performance also requires the interaction of multiple body systems including the nervous, muscular, cardiovascular, and sensory-perceptual systems.

Motor Constructs	Definition
Dexterity	Dexterity is the coordination of small muscle movements that occur in body parts, such as the ability to coordinate fingers to manipulate objects quickly and accurately. It is measured by the NIH Toolbox 9-Hole Pegboard Dexterity Test
Strength	Strength refers to a muscle's ability to generate force against physical objects. Measuring handgrip assesses how strong one's hand grip is, which in turn provides a good approximation of overall muscle strength. It is measured by the NIH Toolbox Grip Strength Test
Balance	Balance refers to the ability to orient the body in space, maintain an upright posture under both static and dynamic conditions, and move and walk without falling. It is measured by the NIH Toolbox Standing Balance Test.
Locomotion	Locomotion refers to the act of moving from one place to the other place, reflecting ambulation ability including walking distance, velocity, and quality of the gait over different environments and ground surfaces. It is assessed by the NIH Toolbox 4-Meter Walk Gait Speed Test.
Endurance	Endurance refers to how long a person can perform a particular activity requiring cardiopulmonary function, biomechanical and neuromuscular function at a particular intensity. Endurance assesses overall cardiovascular endurance. It is measured by the NIH Toolbox 2-Minute Walk Endurance Test

Motor Battery Instruments	Ages	Time to Administer (minutes)
NIH Toolbox 9-hole Pegboard Dexterity Test	3-85	4
NIH Toolbox Grip Strength Test	3-85	3
NIH Toolbox Standing Balance Test	3-85	7
NIH Toolbox 4 Meter Walk Gait Speed Test	7-85	3
NIH Toolbox 2-Minute Walk Endurance Test	3-85	4

NOTE The ***"Time to Administer (minutes)"*** column gives users an idea of how long each test might take; however, please note that testing times could vary based on how prepared the test administrator is going into the session, individual differences among participants, as well as other unplanned activities that may occur during testing.

C.4.1 NIH Toolbox 9-Hole Pegboard Dexterity Test

The NIH Toolbox 9-Hole Pegboard Dexterity Test assesses fine motor dexterity. Dexterity is a central component of hand function and relates to both the speed and accuracy of hand movements during the manipulation of objects. In this task, a nine-hole pegboard is used to assess dexterity and the data are recorded using an on-screen timer on the iPad. The protocol includes one practice and one timed trial with each hand.

Equipment and materials needed:

- iPad
- Jamar® (or Rolyan) 9-Hole Peg Test kit
- Jamar® 9-Hole Peg Test kit replacement pegs

Detailed information on equipment and materials needed for all tests can be found in Appendix 4.

Set-up:

1. Place the pegboard on the table, positioning it in front and at the center of the participant's body. Place the cup with the 9 pegs on the side of the hand being tested.
2. The participant may use the hand not being tested to stabilize the board.
3. Make sure the hand being tested is flat on the table (palm down) until the administrator says **Go**.
4. Use a placemat or piece of rubber shelving to keep the pegboard from slipping on the table. This is a suggestion, but is not required.
5. All instructions as well as data screens are on the iPad.

C.4.1.1 ***9-Hole Pegboard Test Instructions for Ages 3+***

The task is introduced with the Title Screen: NIH Toolbox 9-Hole Pegboard Dexterity Test 3+. At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the test.

Handedness: If this was not entered during registration, the iPad app will not allow this test to be administered. Instead, the examiner will need to ask a set of questions to ascertain handedness and to enter it in the participant registration screen. Please refer to Appendix 2 for details.

Once handedness is entered in the participant registration screen, it will automatically update the instructions on the test so that "RIGHT" or "LEFT" is displayed where appropriate

Follow the set-up instructions outlined on the screen:

Place the pegboard on the table, positioning it in front and at the center of the participant's body. Place the cup with the 9 pegs on the side of the hand being tested. The hand not being tested can be used to stabilize the board. The hand being tested should be flat on the table (palm down) until the administrator says **Go**.

At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the test.

Say: **In this activity we are going to see how fast you work with your hands. You are going to use your RIGHT** (or **LEFT**, as appropriate) **hand only** (point to hand if needed for understanding), and then you will do it again with your LEFT (or RIGHT, as appropriate) hand (point to hand if needed).

Show participant the pegboard and say: **This is a pegboard and these are the pegs. All the pegs are the same. Pick up the pegs one at a time using your (RIGHT (or LEFT,** as appropriate**) hand only** (point to hand if needed)**. Put them in the holes one at a time until all 9 holes are filled. Then take them all out, one at a time, like this.**

The examiner demonstrates the task and says as he/she is working: **The pegs can be put in the holes or taken out in any order. I have extra pegs, so if you drop a peg, don't go after it. I'll put in another one.**

At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the test.

Dominant Hand Practice:

Have participant start with his/her hand flat on table beside pegboard. Remind participant that non-dominant hand can be used to stabilize board and continue**: Let's practice with your RIGHT** (or **LEFT**, as appropriate) **hand** (point to hand if needed)**. You can use your other hand to hold the board in place.**

At the bottom of the screen, it says: **Right** (or **Left** as appropriate) **Hand Practice** and there is a timer with **START** and **RESET** buttons.

Say: **Are you ready? 3, 2, 1, Go!**

Make sure to touch the **START** button as soon as you say '**GO**'. As participant is placing the final peg, say: **And take them out**.

Touch the **STOP** button as soon as the final peg is placed back in the cup. After timer stops, touch the **NEXT** button and confirm your choice in the pop-up window.

There is a **RESET** button if, for some reason, the participant needs to start again. If this happens, the examiner should touch **RESET** and confirm his/her choice in the pop-up window. Start the trial over again, removing all the pegs before starting.

Test Trial (dominant hand):

Say: **Now I will time how fast you can do this. Pick up the pegs one at a time using only your RIGHT** (or **LEFT**, as appropriate) **hand. Put them in the holes, one at a time, until all 9 holes are filled. Then take them all out, one at a time. The pegs can be put in the holes or taken out in any order. Remember to work as fast as you can.**

Have participant start with his/her hand flat on table beside pegboard.
At the bottom of the screen, it says: **Right** (or **Left** as appropriate) **Hand Trial** and there is a timer with **START** and **RESET** buttons.

Say: **Are you ready? 3, 2, 1, Go!**

Make sure to touch the **START** button as soon as you say '**GO**'. As participant is placing the final peg, say: **And take them out**.

Touch the **STOP** button as soon as the final peg is placed back in the cup. After timer stops, touch the **NEXT** button and confirm your choice in the pop-up window.

There is a **RESET** button if, for some reason, the participant needs to start again. If this happens, the examiner should touch **RESET** and confirm your choice in the pop-up window. Start the trial over again, removing all the pegs before starting.

Non-Dominant Hand Practice:

Turn pegboard around so that the cup with the pegs is on the side of the non-dominant hand.

Read: **Now we are going to do the same thing with your other hand. Again, pick up the pegs one at a time using only your LEFT** (or **RIGHT**, as appropriate) **hand** (point to hand if needed)**. Put them in the holes, one at a time, until all 9 holes are filled. Then take them all out, one at a time. The pegs can be put in the holes or taken out in any order.**

Have participant start with his/her hand flat on table beside pegboard. Remind participant that dominant hand can be used to stabilize board and continue**: Let's practice. Remember, you can use your other hand to hold the board in place.**

At the bottom of the screen, it says: **Right** (or **Left** as appropriate) **Hand Practice** and there is a timer with **START** and **RESET** buttons.

Say: **Are you ready? 3, 2, 1, Go!**
Make sure to touch the **START** button as soon as you say '**GO**'. As participant is placing the final peg, say: **And take them out**.

Touch the **STOP** button as soon as the final peg is placed back in the cup. After timer stops, touch the **NEXT** button and confirm your choice in the pop-up window.

There is a **RESET** button if, for some reason, the participant needs to start again. If this happens, the examiner should touch **RESET** and confirm your choice in the pop-up window. Start the trial over again, removing all the pegs before starting.

Test Trial (non-dominant hand):

Say: **Now I will time how fast you can do this. Pick up the pegs one at a time using only your LEFT** (or **RIGHT**, as appropriate) **hand. Put them in the holes, one at a time, until all 9 holes are filled. Then take them all out, one at a time. The pegs can be put in the holes or taken out in any order. Remember to work as fast as you can.**

Have participant start with his/her hand flat on table beside pegboard.

At the bottom of the screen, it says: **Right** (or **Left** as appropriate) **Hand Trial** and there is a timer with **START** and **RESET** buttons.

Say: **Are you ready? 3, 2, 1, Go!**

Make sure to touch the **START** button as soon as you say '**GO**'. As participant is placing the final peg, say: **And take them out**.

Touch the **STOP** button as soon as the final peg is placed back in the cup. After timer stops, touch the **NEXT** button and confirm your choice in the pop-up window.

There is a **RESET** button if, for some reason, the participant needs to start again. If this happens, the examiner should touch **RESET** and confirm your choice in the pop-up window. Start the trial over again, removing all the pegs before starting.

Test ends.

C.4.2 NIH Toolbox Grip Strength Test

This is a measure of upper extremity muscle strength that makes use of a dynamometer. It was originally adapted from the protocol of the American Society of Hand Therapy. The results are recorded on the iPad screen.

Equipment and materials needed:

- iPad
- Jamar® Plus+ (or Rolyan) Digital Hand Dynamometer

Detailed information on equipment and materials needed for all tests can be found in Appendix 4.

Set-up:

Before beginning, be sure the dynamometer is turned on

The handle for gripping the dynamometer is adjustable, but should be initially set at the notch second closest to the unit (touch information button for picture).

Before each trial, press RESET button and then TEST button on the dynamometer to record the grip strength (force)

Support the dynamometer for the participant and ensure the participant is holding the arm being tested next to but not touching his/her side, with elbow bent at 90 degrees.

Procedure:

The testing involves one practice trial with each hand, followed by one test trial with each hand. The alternation allows the hand to recover strength between exertions.

C.4.2.1 ***Grip Strength Test Instructions Ages 3+***

The task is introduced with the Title Screen: NIH Toolbox Grip Strength Test 3+. At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the test.

Handedness: If this was not entered during registration, the iPad app will not allow this test to be administered. Instead, the examiner will need to ask a set of questions to ascertain handedness and to enter it in the participant registration screen. Please refer to Appendix 2 for details.

Once handedness is entered in the participant registration screen, it will automatically update the instructions on the test so that "RIGHT" or "LEFT" is displayed where appropriate

Follow the set-up instructions outlined in the Grip Strength Introduction and on the iPad screen, specifically:

- Before beginning, be sure to turn on the dynamometer.
- The hand for gripping the dynamometer is adjustable, but should be set at the notch second closest to the unit (touch information button for picture).
- Before each trial, press **RESET** button and then **TEST** button on the dynamometer to record the grip strength (force).
- Have the participant sit down in the chair so his/her feet are on the floor or foot plate of the wheelchair and his/her knees are at a 90-degree angle.
- Support the dynamometer for the participant and ensure that the participant is holding the arm being tested at a 90-degree angle, **next to but not touching** his/her body.

Touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***.

Say: **We will use this machine** (show dynamometer) **to measure how strong your hands are. You will squeeze the handle 2 times (one practice and one test trial) with each hand while your arm is against your side** (see note below) **and your elbow is bent like this (demonstrate 90 degrees). The handle won't move, but the machine will show how hard you squeezed.** (Press RESET and TEST, then squeeze to demonstrate). **See?** (Show participant the force measurement.) **Do you have any questions?**

After the participant demonstrates understanding, touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***.

NOTE "Against your side" means next to but not touching your body.

Practice (*dominant hand*):

Press **RESET** and **TEST**.

Say: **Let's practice with your RIGHT** (or **LEFT** as appropriate) **hand** (point to hand if needed)**. When I say 'squeeze,' I want you to squeeze the handle hard, but not as hard as you can.** (Support dynamometer.)

Continue: **Ready? 3-2-1-squeeze.** After 3-4 seconds, say: **Stop.**

Press **RESET** and **TEST** on dynamometer before continuing.

Practice (*non-dominant hand*):

Continue: **Now we're going to practice with your RIGHT** (or **LEFT** as appropriate) **hand** (point to hand if needed)**. When I say 'squeeze,' I want you to squeeze the handle hard, but not as hard as you can.** (Support dynamometer.)

Continue: **Ready? 3-2-1-squeeze.** After 3-4 seconds, say: **Stop.**

Press **RESET** and **TEST** on dynamometer before continuing.

Test Trial *(dominant hand):*

Say: **Now we're going to test each hand, beginning with your RIGHT** (or **LEFT** as appropriate) **hand. When I say 'squeeze,' this time I want you to squeeze the handle as hard as you can.**

Support dynamometer during testing. Continue: **Ready? 3-2-1-squeeze! Harder, harder, harder!** After 3-4 seconds, say: **Stop.**

Record force to nearest tenth of a pound on the iPad screen.

Press **RESET** and **TEST** on dynamometer before next trial.

Touch Next button to record the data and move to non-dominant hand test trial.

Test Trial *(non-dominant):*

Say: **Now we're going to test your LEFT** (or **RIGHT** as appropriate) **hand (point to hand if needed)**. **When I say 'squeeze,' this time I want you to squeeze the handle as hard as you can.**

Support dynamometer during testing. Continue: **Ready? 3-2-1-squeeze! Harder, harder, harder!** After 3-4 seconds, say: **Stop.**

Record force to nearest tenth of a pound on the iPad screen.

Touch Next button to record the data and end the test.

Turn off dynamometer when testing is completed.

C.4.3 NIH Toolbox Standing Balance Test

This task is designed to assess postural sway and to determine participants' vestibulo-spinal function. Children ages 3-6 are asked to complete the first four poses; participants, ages 7-85 years, are asked to complete all five poses.

There are exclusion rules for participants who are not tested by a trained professional. These are:

- Weight over 250 pounds
- Diabetes, depending on comfort
- Joint replacement(s), depending on comfort
- Previous stroke
- Parkinson's disease
- Dizziness/vertigo
- Fallen in the last 6 months more than one time not as a result of an accident
- Multiple sclerosis
- Macular degeneration
- Glaucoma
- Cataracts
- Pregnancy

Equipment and materials needed:

- iPad
- iPod Touch (5th generation or later)
- The BalancePod app, installed on the iPod Touch. BalancePod is available at no additional cost through the App Store. Get BalancePod here.
- Griffin Survivor protective case or similar
- AIREX Balance Pad Elite
- Scott Gait Belt w/Velcro
- Sanitary booties

Detailed information on equipment and materials needed for all tests can be found in Appendix 4.

Set-up:

This task requires the examiner to set up the equipment before the participant arrives.

Upon launching the BalancePod App, the iPod will display a dashboard with two buttons at the bottom of the screen. One button: Standing Balance Test Info directs the user to an informational screen that includes a single text file that scrolls up and down. The second button: Start a Standing Balance Test directs the user to the connection server that communicates between the iPod accelerometer and the iPad test administration.

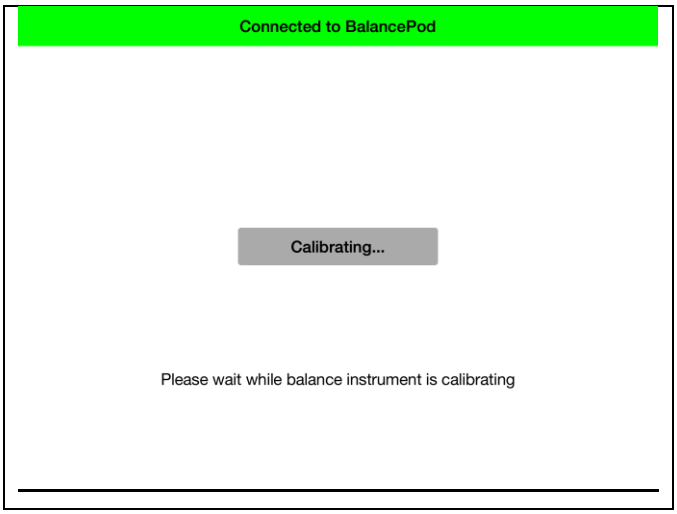
The screen is illustrated below:

iPod / iPad synchronization

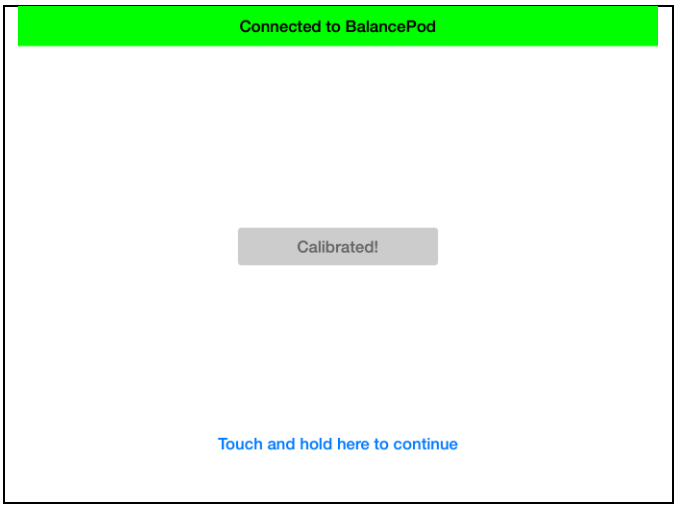
A participant's movement (sway) is measured by an iPod that is enclosed in a protective case. The iPod is attached to the gait belt by a clip, as shown below. It is critical that the iPod be inserted in the protective case in the correct orientation with the home button toward the floor as shown (not upside-down).

- Open the Standing Balance Test on the iPad and turn on the iPod as described above.
- Open the BalancePod App and select Start a Standing Balance Test if you have not already done so.
- On the iPad, select the name of the iPod with which you want to pair the iPad; when they are connected, the **DONE** button becomes activated. Select DONE.

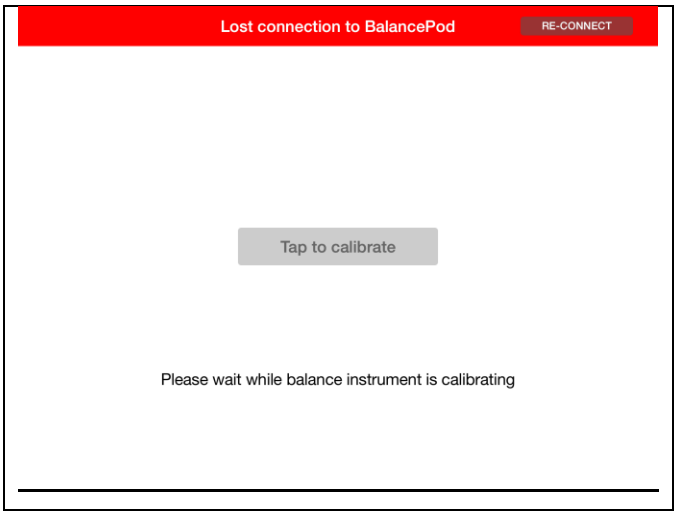
- A green band will appear at the top of both the iPad and the iPod when they are paired and communicating.
- As the iPad and iPod are being calibrated, a gray button tells you the status: calibrating or calibrated.



- When the word **CALIBRATED** appears on the iPad screen, touch the ***Touch and hold here to continue*** button to start the test.



- It is possible but not common that the calibration might need to be repeated after the participant is prepared. If this happens, the following screen appears. Touch the re-connect button until the word CALIBRATED appears on the iPad screen and continue as described above.



Preparing the Participant:

Ask permission from the participant to put the gait belt on him/her. Strap the Velcro gait belt onto the participant so that the belt is fit tightly around the pelvis with the top of the belt at the top of the hip bones. The handles of the belt should be positioned behind the participant and may be used by the examiner in case of loss of balance by the participant. If the participant has a smaller waist, it may be necessary to wrap the belt a second time around the participant (or to use a smaller gait belt). If so, be sure the accelerometer is still positioned appropriately.

For children ages 3-6, the iPod is worn on the back of the belt; when possible, the handles of the gait belt should be positioned on whichever side of the child is closest to where the examiner will be positioned.

For participants ages 7-85, the iPod is attached on the front of the belt (approximately where a typical belt buckle would be located). The handles should be to the back of the participant.

Participants are to stand in their bare/stocking feet (no shoes). They can wear paper booties if they wish. Place a chair placed behind the participant if rest is needed between trials.

The examiner should stand behind the participant (to the side of participants ages 3-6) to be ready to prevent the participant from falling. During testing, the iPad should be placed on a table in close proximity to the examiner.

It is crucial that the iPad is never greater than a few feet (certainly less than 15') away from the iPod and gait belt unit the participant is wearing during testing. While it might be easiest to hold the iPad during testing, in the event that a participant requires help after a stumble or fall, the examiner might have to drop the iPad and endanger its integrity.

Each participant will be given up to two trials to be successful. Use the following guidelines to stop a trial, as any of these are evidence that the participant is no longer holding the pose and has failed the trial:

1. If the arms come off of the chest
2. If the knees bend
3. If the feet move out of original position (move or swivel out or are lifted)
4. If the participant bends forward at the waist (more than 45 degrees). If this happens, the examiner will have to support the participant with the belt
5. If the participant opens his/her eyes during an eyes-closed pose (poses 2 and 4)
6. If the participant says something like: “I cannot do that” or “I do not feel safe trying that”

As needed throughout testing, remind the participant that he/she can step out of the pose, if he/she is feeling unsafe or unable to hold the pose.

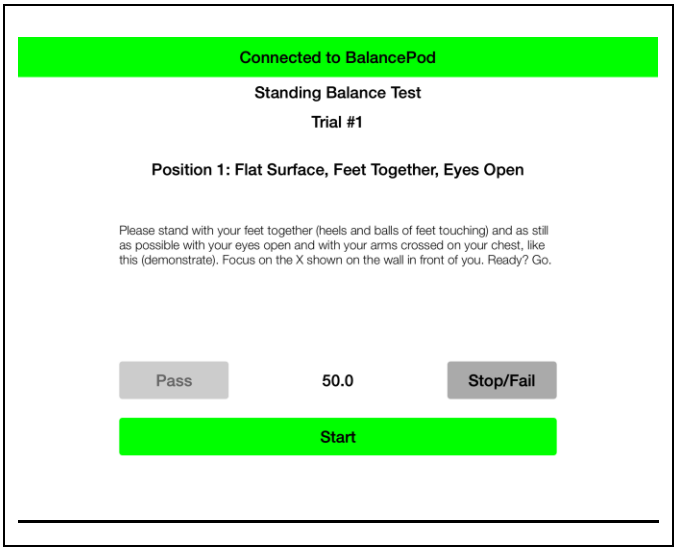
A second trial should be attempted if the first trial is not successfully completed; the examiner should stand close to the participant to prevent actual falls. Some participants will succeed on the second trial, even if they failed the first trial (particularly on the foam or in the tandem pose).

Each pose and trial is presented on a separate iPad screen.

These screens always have: a description of the pose, which trial, and three buttons: Start, Stop/Fail and Pass.

The Start and Stop/Fail are enabled at the beginning of each trial; the Pass button is only enabled after data is received from the balance pod. A tone is played on the iPod once 50 seconds have elapsed.

All the buttons are disabled during the interval between the 50 seconds tone and when data are received on the iPad.


Connected to BalancePod
Standing Balance Test
Trial #1
Position 1: Flat Surface, Feet Together, Eyes Open
Please stand with your feet together (heels and balls of feet touching) and as still as possible with your eyes open and with your arms crossed on your chest, like this (demonstrate). Focus on the X shown on the wall in front of you. Ready? Go.
Pass
50.0
Stop/Fail
Start

Whenever the **PASS** or the **STOP/FAIL** button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice.

The task order is always the same:

- Pose 1: flat surface, feet together, eyes open
- Pose 2: flat surface, feet together, eyes closed
- Pose 3: on foam, feet together, eyes open
- Pose 4: on foam, feet together, eyes closed
- Pose 5: flat surface, tandem stance, eyes open (only given to participants ages 7+)

Throughout the task, the computer may invoke Discontinue Rules automatically. These are:

Rule 1: *If the participant cannot successfully complete either trial of pose 1, the test will be discontinued.*

Rule 2: *If the participant cannot successfully complete either trial of pose 2, he/she will not be asked to perform any more poses with eyes closed (i.e., will not be administered pose 4).*

Rule 3: *If the participant cannot successfully complete either trial of pose 3, the test will skip ahead to pose 5.*

A re-connect button is always enabled should the devices become disconnected.

Age specific instructions:

Standing Balance Test Instructions Ages 3-6
Standing Balance Test Instructions Ages 7+

C.4.3.1 Standing Balance Test Instructions Ages 3-6

The task is introduced with the following Title Screen: NIH Toolbox Standing Balance Test 3-6. At the bottom of the screen is a button ***Touch and hold here to continue***. Touch and hold that button to begin the test.

Participants are to stand in their bare/stocking feet (no shoes, but paper booties can be offered).

While putting the belt and accelerometer on the participant, say: **This is a test of your balance. There are as many as 4 different poses that you will be asked to do. During each pose, you will be asked to stand as steady as possible for 50 seconds. You will have a second chance if you cannot hold the position for 50 seconds. Between each set of poses, you may rest in the chair if needed. Please try to do your best. I will demonstrate how I want you to stand before each pose.**

Explain that the iPod on the belt is used to measure balance and ask permission to put on the belt or ask the participant to help. The belt should fit tightly around the pelvis. For ages 3-6, the iPod should be placed on the back of the belt and when possible the handles on the belt should be on the participant's side.

A sheet of paper with an attractive picture or a large X should be placed on the wall at the participant's eye level. For the eyes open poses, the participant will be asked to focus on this picture or X. The participant is positioned one meter away from the wall, directly in front of the picture or X.

The examiner should proceed through each of the poses with the participant until the test is completed. After each trial or pose is completed, the examiner should ask: **Are you ready for the next one?**

If the participant says NO or otherwise indicates that he/she needs to rest, say: **Please sit in this chair to rest.** The examiner should note the time the participant begins resting; *a maximum of one minute of rest is permitted.*

Every 15 seconds or so, the examiner should ask: **Are you ready to continue?** If the participant indicates that he/she is ready, proceed with the next trial or pose. If the participant is not ready, wait and ask again in another 15 seconds.

If the participant is not ready by the end of the one-minute rest period, *the test should be discontinued.* In such a case, the examiner should say: **Let's go on to another activity.**

As needed throughout the testing, the examiner should remind the participant that he/she can step out of the pose if he/she is feeling unsafe or unable to hold the pose.

When the participant is ready for testing, the examiner should touch and hold the button at the bottom of the screen to advance to the test itself.

Pose 1 Screen: Flat surface, feet together, eyes open

The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please stand with your feet together (heels and balls of feet touching) and as still as possible with your eyes open and with your arms crossed on your chest, like this** (demonstrate)**. Focus on the X shown on the wall in front of you. Ready?** After the participant assumes the position, the examiner touches the **START** button and says: **Go.**

The examiner should check the participant's posture. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant. In addition, an audible tone will play when 50 seconds has elapsed, alerting both the examiner and the participant that the trial has ended.

Choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason.

If the first trial is failed for any reason, start the second trial of this pose; the examiner should say: **Let's try that one again. Please stand with your feet together (heels and balls of feet touching) and as still as possible with your eyes open and with your arms crossed on your chest, like this** (demonstrate)**. Focus on the X shown on the wall in front of you. Ready?** The examiner touches the **START** button and says: **Go.** Again, choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason.

After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the **PASS or STOP/FAIL** button**.**

Whenever the **PASS** or the **STOP/FAIL** button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice to move onto the next trial.

Note: If a participant fails both trials of Pose 1, the test is terminated.

Once the participant successfully completes a trial, say: **Are you ready for the next one?**

Proceed with the next pose or allow the participant to rest, following the procedures noted above. If participant fails trial 2, the discontinue rule is invoked; say: **We are done with this activity.**

Pose 2 Screen: Flat surface, feet together, eyes closed: is the same as Pose 1, except this time the participant's eyes are closed.

The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please stand with your feet together (heels and balls of feet touching) and as still as possible with your eyes closed and with your arms crossed on your chest, like**

this (demonstrate)**. Ready?** After the participant assumes the position, the examiner touches the **START** button and says: **Go.**

The examiner should check the participant's posture. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant.

Choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason.

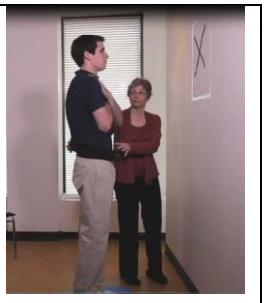
If the first trial is failed for any reason, start he second trial of this pose; the examiner should say: **Let's try that one again. Please stand with your feet together (heels and balls of feet touching) and as still as possible with your eyes closed and with your arms crossed on your chest, like this** (demonstrate)**. Ready?** The examiner touches the **START** button and says: **Go.** Again, choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason.

After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the **PASS or STOP/FAIL** button**.**

Whenever the **PASS** or the **STOP/FAIL** button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice to move onto the next trial.

After participant completes one or both trials, say: **Are you ready for the next one?** Proceed with the next pose or allow the participant to rest, following the procedures noted above.

Pose 3 Screen: Foam surface, feet together, eyes open



The examiner should pick up the blue pad and place it on the floor one meter in front of the picture on the wall. The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please step onto the foam and put your feet together (heels and balls of feet touching) and stand as still as possible with your eyes open and your arms crossed on your chest, like this** (demonstrate)**. Focus on the X shown on the wall in front of you. Ready?** After the participant assumes the position, the examiner touches the **START** button and says: **Go.**

The examiner should check the participant's posture. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant.

Choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason.

If the first trial is failed for any reason, start the second trial of this pose; the examiner should say: **Let's try that one again. Please step onto the foam and put your feet together (heels and balls of feet touching) and stand as still as possible with your eyes open and your arms crossed on your chest, like this** (demonstrate)**. Focus on the X shown on the wall in front of you. Ready?** The examiner touches the **START** button and says: **Go.** Again, choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason.

After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the **PASS or STOP/FAIL** button**.**

Whenever the **PASS** or the **STOP/FAIL** button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice to move onto the next trial.

After participant completes one or both trials, say: **Are you ready for the next one?** Proceed with the next pose or allow the participant to rest, following the procedures noted above.

Pose 4 Screen: Foam surface, feet together, eyes closed: is the same as Pose 3 except that the participant's eyes are closed. The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please step onto the foam and put your feet together (heels and balls of feet touching) and stand as still as possible with your arms crossed on your chest, and then close your eyes, like this** (demonstrate for participant)**. Ready?** After the participant assumes the position, the examiner touches the **START** button and says: **Go.**

The examiner should check the participant's posture. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant.

Choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason.

If the first trial is failed for any reason, start the second trial of this pose; the examiner should say: **Let's try that one again. Please step onto the foam and put your feet together (heels and balls of feet touching) and stand as still as possible with your arms crossed on your chest, then close your eyes, like this** (demonstrate for participant)**. Ready?** The examiner touches the **START** button and says: **Go.** Again, choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason.

After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the **PASS or STOP/FAIL** button**.**

Whenever the **PASS** or the **STOP/FAIL** button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice.

When the participant has completed pose 4, say: **We are done with this activity.**

C.4.3.2 Standing Balance Test Instructions Ages 7+

The task is introduced with the following Title Screen: NIH Toolbox Standing Balance Test 7+. At the bottom of the screen is a button ***Touch and hold here to continue***. Touch and hold that button to begin the test.

Participants are to stand in their bare/stocking feet (no shoes, but paper booties can be offered).

While putting the belt and iPod on the participant, say: **This is a test of your balance. There are as many as 5 different poses that you will be asked to do. During each pose, you will be asked to stand as steady as possible for 50 seconds. You will have a second chance if you cannot hold the position for 50 seconds. Between each set of poses, you may rest in the chair if needed. Please try to do your best. I will demonstrate how I want you to stand before each pose.**

Explain that the iPod on the belt is used to measure balance and ask permission to put on the belt or ask the participant to help. The belt should fit tightly around the pelvis and the handles of the belt should be positioned to the back of the participant. For ages 7 and older, the iPod is placed on the front of the belt.

A sheet of paper with an attractive picture or large X should be placed on the wall at the participant's eye level. For the eyes open poses, the participant will be asked to focus on this picture. The participant is positioned one meter away from the wall, directly in front of the picture.

The examiner should proceed through each of the poses with the participant until the test is completed.

After each trial or pose is completed, the examiner should ask: **Are you ready for the next one?**

If the participant says NO or otherwise indicates that he/she needs to rest, say:
Please sit in this chair to rest. The examiner should note the time the participant begins resting; *a maximum of one minute of rest is permitted.*

Every 15 seconds or so, the examiner should ask: **Are you ready to continue?** If the participant indicates that he/she is ready, proceed with the next trial or pose. If the participant is not ready, wait and ask again in another 15 seconds.

If the participant is not ready by the end of the one-minute rest period, *the test should be discontinued.* In such a case, the examiner should say: **Let's go on to another activity.**

As needed throughout the testing, the examiner should remind the participant that he/she can step out of the pose if he/she is feeling unsafe or unable to hold the pose.

When the participant is ready for testing, the examiner should touch and hold the button at the bottom of the screen to advance to the test itself.

Pose 1 Screen: Flat surface, feet together, eyes open

The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please stand with your feet together (heels and balls of feet touching) and as still as possible with your eyes open and with your arms crossed on your chest, like this** (demonstrate for participant)**. Focus on this X shown on the wall in front of you. Ready?**

After the participant assumes the position, the examiner touches the **START** button and says: **Go.**

The examiner should check the participant's posture. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant. In addition, an audible tone will play when time has elapsed, so the both the examiner and participant know the trial has ended. Choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason.

If a second trial is needed, start the second trial of this pose; the examiner should say: **Let's try that one again. Please stand with your feet together (heels and balls of feet touching) and as still as possible with your eyes open and with your arms crossed on your chest, like this** (demonstrate)**. Focus on the X shown on the wall in front of you. Ready?**

The examiner touches the **START** button and says: **Go.** Again, choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason. After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the **PASS or STOP/FAIL** button**.**

Whenever the **PASS** or the **STOP/FAIL** button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice to move on to the next trial.

Note: If a participant fails both trials of Pose 1, the test will be terminated.

Once the participant successfully completes a trial, say: **Are you ready for the next one?**

Proceed with the next pose or allow the participant to rest, following the procedures noted above. If participant fails trial 2, the discontinue rule is invoked; say: **We are done with this activity.**
Pose 2 Screen: Flat surface, feet together, eyes closed: the same as Pose 1, except this time the participant's eyes are closed. The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please stand with your feet together (heels and balls of feet touching) and as still as possible with your eyes closed and with your arms crossed on your chest, like this** (demonstrate)**. Ready?**

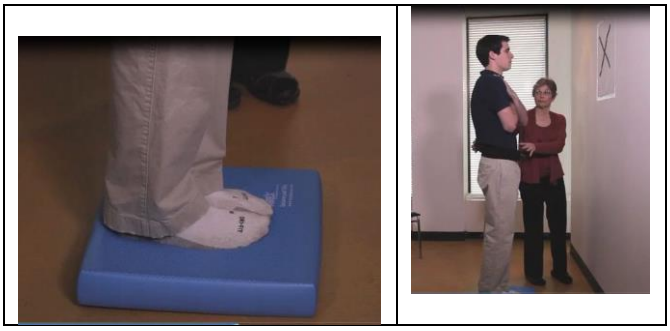
After the participant assumes the position, the examiner touches the **START** button and says: **Go.** The examiner should check the participant's posture and that the eyes remain closed. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant.

Choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason. If the first trial is failed for any reason, start the second trial of this pose; the examiner should say: **Let's try that one again. Please stand with your feet together (heels and balls of feet touching) and as still as possible with your eyes closed and with your arms crossed on your chest, like this** (demonstrate)**. Ready?**

The examiner touches the **START** button and says: **Go.** Again, choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason. After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the **PASS or STOP/FAIL** button**.** Whenever the **PASS** or the **STOP/FAIL** button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice to move onto the next trial.

After participant completes one or both trials, say: **Are you ready for the next one?** Proceed with the next pose or allow the participant to rest, following the procedures noted above.

Pose 3 Screen: Foam surface, feet together, eyes open



The examiner should pick up the blue pad and place it on the floor one meter in front of the picture on the wall. The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please step onto the foam and put your feet together (heels and balls of feet touching) and stand as still as possible with your eyes open and your arms crossed on your chest, like this** (demonstrate)**. Focus on the X shown on the wall in front of you. Ready?**
After the participant assumes the position, the examiner touches the **START** button and says: **Go.** The examiner should check the participant's posture. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant.

Choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason. If the first trial is failed for any reason, start the second trial of this pose; the examiner should say: **Let's try that one again. Please step onto the foam and put your feet together (heels and balls of feet touching) and stand as still as possible with your eyes open and your arms crossed on your chest, like this** (demonstrate)**. Focus on the X shown on the wall in front of you. Ready?**

The examiner touches the **START** button and says: **Go.** Again, choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason. After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the **PASS or STOP/FAIL** button**.** Whenever the **PASS** or the **STOP/FAIL** button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice to move onto the next trial.

After participant completes one or both trials, say: **Are you ready for the next one?** Proceed with the next pose or allow the participant to rest, following the procedures noted above.

Pose 4 Screen:

Foam surface, feet together, eyes closed: is the same as Pose 3 except that the participant's eyes are closed. The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please step onto the foam and put your feet together (heels and balls of feet touching) and stand as still as possible with your arms crossed on your chest, and then close your eyes, like this** (demonstrate)**. Ready?**

After the participant assumes the position, the examiner touches the **START** button and says: **Go.** The examiner should check the participant's posture. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant. Choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason.

If the first trial is failed for any reason, start the second trial of this pose; the examiner should say: **Let's try that one again. Please step onto the foam and put your feet together (heels and balls of feet touching) and stand as still as possible with your arms crossed on your chest, then close your eyes, like this** (demonstrate)**. Ready?** The examiner touches the **START** button and says: **Go.** Again, choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason.

After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the **PASS or STOP/FAIL** button**.** Whenever the **PASS** or the **STOP/FAIL** button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice to move onto the next trial.

After participant completes one or both trials, say: **Are you ready for the next one?** Proceed with the next pose or allow the participant to rest, following the procedures noted above.

Pose 5: Flat surface, tandem stance, eyes open:

The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please stand with the heel of one foot touching the toes of the other foot on the ground. Keep them in a straight line. Stand as still as possible with your eyes open and with your arms crossed on your chest, like this** (demonstrate for participant)**. Before you do this, try each foot in front and decide for yourself which one is more comfortable. Then, focus on the X on the wall in front of you. Ready?**

After the participant assumes the position, the examiner touches the **START** button and says: **Go.** The examiner should check the participant's posture. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant.

Choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason.
If the first trial is failed for any reason, start he second trial of this pose; the examiner should say: **Let's try that one again. Please stand with the heel of one foot touching the toes of the other foot on the ground. Keep them in a straight line. Stand as still as possible with your eyes open and with your arms crossed on your chest, like this** (demonstrate for participant)**. Focus on the X shown on the wall in front of you. Ready?**

The examiner touches the **START** button and says: **Go.** Again, choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason. After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the **PASS or STOP/FAIL** button**.** Whenever the **PASS** or the **STOP/FAIL** button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice.

When the participant has completed pose 5, say: **We are done with this activity.**

C.4.4 NIH Toolbox 4-Meter Walk Gait Speed Test

This measure of gait speed is administered in an open hallway and can use part of the same course as the 2-Minute Walk Endurance Test (See Appendix 6). The test is administered two times, both at the participant's normal pace. A practice trial precedes the timed trials.

The instructions are on and a timer is embedded in the iPad screen. The timing begins (START button) when the participant steps over the starting line. The foot does not need to be flat on the floor. Timing stops when one of the participant's feet is completely across the end/finish line (the line at 4 meters, not at 5 meters where the cone is).

The examiner should be positioned so that he/she can easily see when the participant steps across each line. If necessary, walk behind and to the side of the participant as he/she walks.

Participants should not do this walk in bare feet, high-heeled or open-back shoes, sandals, or flip-flops. Paper booties may be offered.

Equipment and materials needed:

- iPad
- Measuring tape with meters and feet
- Set of two cones
- Walking course set up diagram

Detailed information on equipment and materials needed for all tests can be found in Appendix 4.

Detailed information on setting up the walking courses for the NIH Toolbox 4-Meter Walk Gait Speed Test and 2-Minute Walk Endurance Test can be found in Appendix 6.

C.4.4.1 ***4-Meter Walk Gait Speed Test Instructions Ages 7+***

The task is introduced with the following Title Screen: NIH Toolbox 4-Meter Gait Speed Test 7+. At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the test.

The examiner should observe how participants walk normally. If they use a cane or other walking device and feel they need it for the walking test, they may use it. If the participant uses such a device, the examiner should note its use.

First Screen:
The examiner should show the participant the walking course and say: **This activity involves walking from one place to another. This is our walking course** (point to the course)**. I want you to walk to the other end of the course at your usual speed, just as if you were walking down the street to go to the store.**

Touch and hold button for next screen.

Demonstration Screen:

The examiner explains the walk: **Let me show you what I want you to do. Put both your feet together behind this line (point to starting line). Walk all the way past the cone on the other end before you stop.**

Before the demonstration, say: **3, 2, 1, Go!** Examiner should demonstrate the walk. After returning, examiner presses Touch and hold button for next screen.

Practice Screen:

After demonstration, have the participant stand with both feet touching the start line; say: **Now you try. Remember to walk at your usual speed and keep walking until you pass the cone. When I want you to start, I will say: 3, 2, 1, go. Do you have any questions?** (Answer any questions.) **Ready? 3, 2, 1, Go!**

When the participant passes the cone, say: **That's good. Do you have any questions?** (Answer any questions.) Touch and hold that button for next screen.

After practice is completed, the following screens will then be presented. As below, each shows what the examiner is to say and do.

Test Intro Screen:

Begin timing (press start/stop button) when the participant steps over (first footfall) the starting line. Stop timing when one of the participant's feet is completely across the end/finish line (the line at 4.0 meters – not the line at 5.0 meters).

Position yourself so that you can easily see when the participant steps across each line. If necessary, walk behind and to the side of the participant as he/she walks.

If the participant stumbles or tries to run, void that trial and ask the participant to do another trial. To do this on the screen, press the RESET button to set the timer back to zero (confirming when the pop-up screen appears). Then give the trial again following all instructions.

Test Trial 1 Screen:

Say: **This time, I am going to time you as you walk at your usual speed. Are you ready? 3, 2, 1, Go!**

Make sure to touch the **START** button as soon as the participant steps over the starting line.

Touch the **STOP** button as soon as one of the participant's feet is completely across the finish line.

After timer stops, touch the **NEXT** button and confirm your choice in the pop-up window.

Test Trial 2 Screen**:**

Say: **Now I want you to repeat the walk. Remember to walk at your usual pace and go all the way past the cone at the other end of the course. Are you ready? 3, 2, 1, Go!**

Make sure to touch the **START** button as soon as the participant steps over the starting line.

Touch the **STOP** button as soon as one of the participant's feet is completely across the finish line.

After timer stops, touch the **NEXT** button and confirm your choice in the pop-up window.

If needed, have the participant rest in a chair for at least one minute before the next task.

C.4.5 NIH Toolbox 2-Minute Walk Endurance Test

This measure of endurance can be administered to participants ages 3 to 85. It is administered in an open hallway. The participant should be wearing comfortable shoes such as athletic shoes. A timer and grid for marking the number of feet traversed is embedded on the iPad screen. All the instructions appear on the iPad screen.

Participants should not do this test in bare feet, high-heeled or open-back shoes, sandals, or flip-flops.

Equipment and materials needed:

- iPad
- Two cones
- Chair
- Measuring tape
- Masking tape

Detailed information on equipment and materials needed for all tests can be found in Appendix 4.

Detailed information on setting up the walking courses for the NIH Toolbox 4-Meter Walk Gait Speed Test and 2-Minute Walk Endurance Test can be found in Appendix 6.

C.4.5.1 NIH Toolbox 2-Minute Walk Endurance Test Instructions Ages 3+

The task is introduced with the following Title Screen: NIH Toolbox 2-Minute Walk Endurance Test 3+. At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the test.

> The examiner should observe how participants normally walk. If they use a cane or other walking device and feel they need it for the walking test, they may use it. If the participant uses such a device, the examiner should make a note of this.

First Screen: Examiner should have participant sit in a chair near the beginning of the walking course.

Introduce the task; say: **This is an activity that shows how physically fit you are by seeing how far you can walk in 2 minutes. I will ask you to walk as fast as you can until I ask you to stop. I know this is hard for some people so don't worry if you have to slow down or rest. If you do stop or slow down, start walking again as soon as you feel you are ready do so.**

Continue: **Is there any reason you cannot do the walk? Does anything hurt or are you in pain? What I would like here is to have you walk as far as you can in this short period of time.** If participant does not feel he/she can do this task, note this and continue with another measure.

Continue: **You and I will not talk while you are walking because this might make you walk more slowly. I will, however, let you know how much time you have to walk and when you are almost done.**

Touch and hold button to go to next screen.

Demonstration & Practice Screen: While demonstrating the first part of the task, say: **Let me show you what you are going to do. You will start with your feet behind this line** (Point to starting line)**. When I say 'Go,' you will walk back and forth around the cones as fast as you can without running or hurting yourself.**

You will begin after I say 'Ready, 3, 2, 1, Go!' As you pass the cone, do not stop or slow down. When I tell you to stop, stop where you are on the path until I come to you.

Demonstrate task and say: **Watch me as I show you. You see that I am walking fast but not running and that I am not slowing or stopping when I pass the cone. Do you have any questions?** Answer questions as necessary.

Practice: Ask participant to walk course once down and back; say: **Now you can practice. Walk the path, out and back one time; go around the cone without slowing down. Ready, 3, 2, 1, Go!** When participant is finished, say: **Do you have any questions?** Answer any questions participant has. Touch and hold the button to move to the next screen.

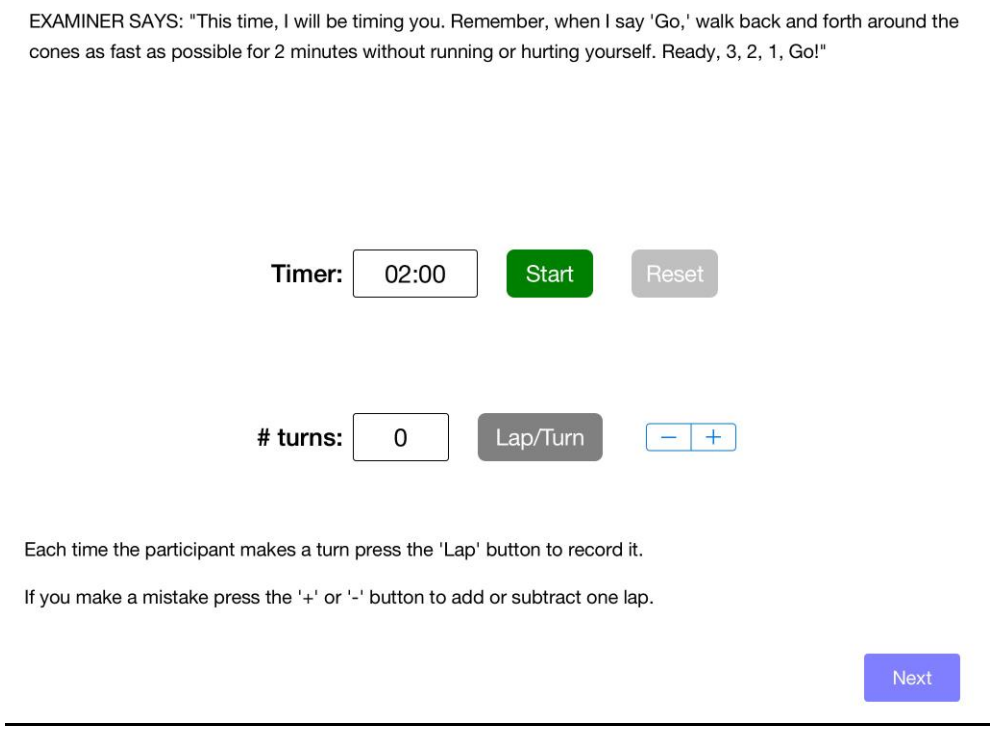
Test Trial Screen:

- The test trial screen has a timer centered in the middle of the screen that shows 2:00 automatically when the screen appears.
- The timer has a START/STOP button and a RESET button.
- Touching START turns the button into a STOP button.
- Touching STOP activates the RESET button, meaning START cannot be activated again until RESET is touched.

Once the RESET button is touched, a pop-up will appear that asks the examiner to confirm the RESET and if confirmed, the timer will be reset.

- Resetting also presents the initial instructions at the top of the screen again.
- Directly below the timer is the 'lap/turn' button that records the number of times a user has passed a cone and next to the lap/turn button is a '+' button and below that is '-' button.
- The + and - buttons allow the user to add or subtract laps in case an error was made.
- A counter actively keeps track of how many times lap was touched or what the + and - buttons added or subtracted from that total.
- At the bottom of the screen, there is text saying: Each time the participant makes a turn press the "Lap" button to record it and If you make a mistake press the "+" or "-" button to add or subtract one lap.

Below is the test trial screen:


EXAMINER SAYS: "This time, I will be timing you. Remember, when I say 'Go,' walk back and forth around the cones as fast as possible for 2 minutes without running or hurting yourself. Ready, 3, 2, 1, Go!"
Timer:
02:00
Start
Reset
turns:
0
Lap/Turn
Each time the participant makes a turn press the 'Lap' button to record it.
If you make a mistake press the '+' or '-' button to add or subtract one lap.
Next

Continue by saying: **This time, I will be timing you. Remember, when I say 'Go,' walk back and forth around the cones as fast as possible for 2 minutes without running or hurting yourself. Ready, 3, 2, 1, Go!** Start the timer and keep track of the laps as described above.

At the same time, examiner should provide the following feedback:*

1 minute: **You are doing well. You have 1 minute to go.**

*If participant is resting at one-minute reminder, encourage him/her to continue and change statement to: **You have only 1 minute left. Rest as long as you need; start walking again as soon as you feel able to do so.**

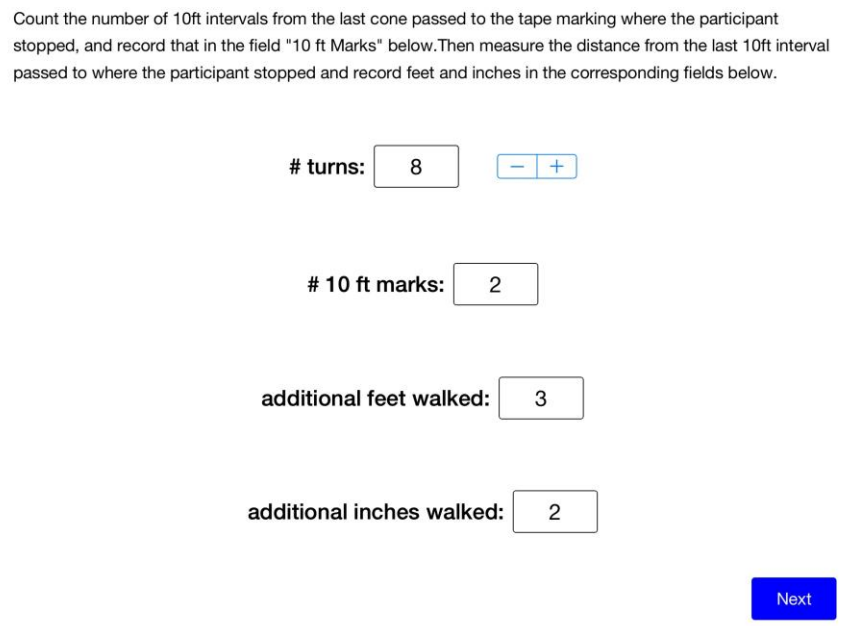
When time reads 0:15, tell the participant: **In a moment, I'm going to ask you to stop. When I do, just stop right where you are and I will come to you.** When five seconds remain, examiner should count down: **5, 4, 3, 2, 1, stop. Please stay where you are and rest.**

The examiner put a piece of tape on the floor to mark where participant stopped; the tape should be placed behind the participant's heel.

The examiner should direct participant to sit in the chair while the examiner measures the distance from the last cone passed to the piece of tape. The examiner should press NEXT button on the test trial screen to submit the trial data (the laps). The Next button becomes active at the end of the trial (when 2 minutes have elapsed). Once "Next" is pressed, the app proceeds to the screen where more detailed measurements can be entered.

A new screen will appear. This screen is a data screen that shows the Laps that were recorded on the previous screen and number wheels for the number of 10 feet, single feet, and inches measured after the participant completes the two minutes.

This data entry screen is given below:


Count the number of 10ft intervals from the last cone passed to the tape marking where the participant stopped, and record that in the field "10 ft Marks" below.Then measure the distance from the last 10ft interval passed to where the participant stopped and record feet and inches in the corresponding fields below.
turns: 8
10 ft marks: 2
additional feet walked: 3
additional inches walked: 2
Next

The examiner should record the distance from the last cone to where the participant stopped on this data screen and press NEXT to submit the data. All the fields can be adjusted until NEXT is pressed.

C.5 Sensation Domain

Sensation refers to the biochemical and neurologic process of detecting incoming nerve impulses as nervous system activity. Sensory processes are vital to one's level of independence in relationships with others, academic and occupational endeavors, and activities of daily living.

Sensation & Pain Constructs	Definition
Pain	Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. It is measured by the NIH Toolbox Pain Interference Survey and the NIH Toolbox Pain Intensity Survey.
Olfaction	The human olfactory system allows us to detect odors, to recognize and discriminate odor qualities, and to identify the sources of odors in our world. It is measured by the NIH Toolbox Odor Identification Test.
Vision	Vision is a complex sensation that provides us with a personal, conscious representation of our surrounding environment. Visual impairment can impose various limitations on a person's functional ability including reading, mobility (which includes driving), visual information processing (also called "seeing"), and visually guided motor behavior (also called "manipulation"). It is measured by the NIH Toolbox Visual Acuity Test.
Audition	Audition, or hearing, is the processing of sound in the environment. It is measured by the NIH Toolbox Words-in-Noise (WIN) Test.
Taste	Taste perception, also known as gustation, arises from stimulation of taste receptors, which are composed of epithelial cells, found most frequently on the papillae of the tongue throughout the oral cavity. It is measured by the NIH Toolbox Regional Taste Test.

Sensation & Pain Instruments	Ages	Time to Administer (minutes)
NIH Toolbox Pain Interference Survey	18-85	3
NIH Toolbox Pain Intensity Survey	18-85	1
NIH Toolbox Odor Identification Test	3-85	4-5
NIH Toolbox Visual Acuity Test	3-85	3
NIH Toolbox Words-in-Noise (WIN) Test	6-85	6
NIH Toolbox Regional Taste Intensity Test	12-85	6

NOTE The ***"Time to Administer (minutes)"*** column gives users an idea of how long each test might take; however, please note that testing times could vary based on how prepared the test administrator is going into the session, individual differences among participants, as well as other unplanned activities that may occur during testing.

NOTE Only the individual Sensation instruments listed above are available through the NIH Toolbox App at this time. The Sensation Battery will be released later in 2015.

C.5.1 NIH Toolbox Pain Interference Survey (18+) & NIH Toolbox Pain Intensity Survey (18+)

Equipment and materials needed:

- iPad

Two instruments, NIH Toolbox Pain Interference CAT Age 18+ and NIH Toolbox Pain Intensity FF Age 18+), make up the measurement of this construct. Each is self-administered; for each, instructions are presented on the iPad screen. Each instrument is presented separately to the participant.

Pain Intensity consists of one item asking about the participant's level of pain in the past seven days. Participants are asked to rate their pain on a scale from 0 (no pain) to 10 (worst imaginable pain).

NIH Toolbox Pain Interference CAT asks participants about how their experience of pain interfered with or affected their enjoyment of various daily activities in the past seven days. The scale is computer-adaptive and has a minimum of four questions and a maximum of 12 questions. The questions ask for a response on a 5-point scale. Some of the items are rated: *Not at all; A little bit; Somewhat; Quite a bit; Very much;* other items are rated: *Never; Rarely; Sometimes; Often; Always*.

Administration:

Since there is no specific introduction to the Pain Surveys, the NIH Toolbox Emotion Instructions should be selected from the instrument list, to introduce them. These instructions read:

"On the next screens, we will ask you questions about your thoughts, feelings and behaviors. Read each question carefully and answer as well as you can. There is no right or wrong answer, only what is true for you and describes your thoughts, feelings, and behaviors.

Select an answer by touching your answer choice on the screen. After you make your choice, the computer will automatically go on to the next question. If you want to change your answer, touch the GO BACK button to return to the question, then touch a different answer choice."

After this introduction, the surveys are automatically presented, first with the question from the Pain Intensity survey followed by the questions from the Pain Interference survey.

C.5.2 NIH Toolbox Odor Identification Test

This task assesses the ability to identify various odors. Before identifying the odors, the child participants (ages 3-9 years) are asked to identify the eight pictures that are used as answer choices. Having identified the pictures, they are asked if they have smelled the objects or foods depicted. The examiner needs to have an iPad, scratch 'n' sniff cards, and a scratcher (*e.g.,* guitar pick) to administer this measure.

Equipment and materials needed:

- iPad
- NIH Toolbox Odor Identification Cards
- Scratcher

Detailed information on equipment and materials needed for all tests can be found in Appendix 4.

For the test items, all participants (ages 3-85 years) use scratch 'n' sniff cards. These cards are numbered to match not only the order in which they are presented but the number on the iPad screen as well. After scratching them, participants are asked to identify which of four pictures on the screen matches the odor they have just smelled.

Children ages 3 to 9 are handed cards that the examiner scratched and are asked to identify five odors; participants ages 10 and above are asked to scratch and identify nine odors.
There are two versions of the instructions: one for ages 3-9 and one for ages 10 and above. In both versions, the participant is allowed to go back to the last item he/she attempted.

If either a child or adult participant has difficulty touching the pictures on the iPad screen, he/she may point and the examiner may touch the iPad. When this happens, the examiner should say something like the following to the participant: **You can point to the picture you want and then I will touch it for you.** Similarly, if a participant has trouble reading picture labels, the examiner may read the labels for him/her.

Age-specific Instructions:

NIH Toolbox Odor Identification Test Ages 3-9

NIH Toolbox Odor Identification Test Ages 10+

C.5.2.1 NIH Toolbox Odor Identification Test Instructions Ages 3-9

The task is introduced with the following Title Screen: NIH Toolbox Odor Identification Test 3-9. At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the test.

For this age group, there are two parts to the instructions: picture identification and odor identification.

Part 1: Picture Identification:
The child is presented with a screen that shows eight pictures: *Popcorn, Flower, Lemon, Play Doh, Bubble Gum, Chocolate, Coffee,* and *Cinnamon.* A voice on the iPad asks the child to: '**Touch the picture of….'**

The examiner should read the screen: **Now we are going to look at some pictures. I want to see if you know what they are.** At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin.

Question 1: the voice on the iPad says: **Touch the picture of *a flower.***

If correct, the voice on the iPad will say: **That's right!** Or **Great Job!** (Alternating throughout this part of the task).

If incorrect, the picture of a flower will flash and the voice will say: **This is a *flower.***

The screen will change to the Flower picture and a voice on the iPad will ask: **Have you ever smelled a *flower?***

Touch *yes* or *no* on the screen to indicate the child's answer, then touch NEXT at the bottom of the screen to go on to the next item. The answer choice can be changed between No and Yes until 'Continue' is pressed to advance to next screen. No Go Back is permitted in Picture Identification component.

Question 2: the voice on the iPad says: **Touch the picture of *popcorn.***

If correct, the voice on the iPad will say: **That's right!** Or **Great Job!** (Alternating throughout this part of the task).

If incorrect, the picture of popcorn will flash and the voice will say: **This is *popcorn.***

The screen will change to the Popcorn picture and a voice on the iPad will ask: **Have you ever smelled *popcorn?***

Touch *yes* or *no* on the screen to indicate the child's answer, then touch NEXT at the bottom of the screen to go on to the next item. The answer choice can be changed between No and Yes until 'Continue' is pressed to advance to next screen. No Go Back is permitted in Picture Identification component.

Question 3: the voice on the iPad says: **Touch the picture of a *lemon.***

If correct, the voice on the iPad will say: **That's right!** Or **Great Job!** (Alternating throughout this part of the task).

If incorrect, the picture of lemons will flash and the voice will say: **This is a *lemon.***

The screen will change to the Lemon picture and a voice on the iPad will ask: **Have you ever smelled a *lemon?***

Touch *yes* or *no* on the screen to indicate the child's answer, then touch NEXT at the bottom of the screen to go on to the next item. The answer choice can be changed between No and Yes until 'Continue' is pressed to advance to next screen. No Go Back is permitted in Picture Identification component.

Question 4: the voice on the iPad says: **Touch the picture of *Play Doh.***

If correct, the voice on the iPad will say: **That's right!** Or **Great Job!** (Alternating throughout this part of the task).

If incorrect, the picture of Play Doh will flash and the voice will say: **This is *Play Doh.***

The screen will change to the Play Doh picture and a voice on the iPad will ask: **Have you ever smelled *Play* Doh?**

Touch *yes* or *no* on the screen to indicate the child's answer, then touch NEXT at the bottom of the screen to go on to the next item. The answer choice can be changed between No and Yes until 'Continue' is pressed to advance to next screen. No Go Back is permitted in Picture Identification component.

Question 5: the voice on the iPad says: **Touch the picture of *cinnamon.***

If correct, the voice on the iPad will say: **That's right!** Or **Great Job!** (Alternating throughout this part of the task).

If incorrect, the picture of cinnamon will flash and the voice will say: **This is *cinnamon.***

The screen will change to the cinnamon picture and a voice on the iPad will ask: **Have you ever smelled *cinnamon?***

Touch *yes* or *no* on the screen to indicate the child's answer, then touch NEXT at the bottom of the screen to go on to the next item. The answer choice can be changed between No and Yes until 'Continue' is pressed to advance to next screen. No Go Back is permitted in Picture Identification component.

Question 6: the voice on the iPad says: **Touch the picture of *coffee.***

If correct, the voice on the iPad will say: **That's right!** Or **Great Job!** (Alternating throughout this part of the task).

If incorrect, the picture of coffee will flash and the voice will say: **This is *coffee.***
The screen will change and a voice on the iPad will ask: **Have you ever smelled *coffee?***

Touch *yes* or *no* on the screen to indicate the child's answer, then touch NEXT at the bottom of the screen to go on to the next item. The answer choice can be changed between No and Yes until 'Continue' is pressed to advance to next screen. No Go Back is permitted in Picture Identification component.

Question 7 the voice on the iPad says: **Touch the picture of *chocolate.***

If correct, the voice on the iPad will say: **That's right!** Or **Great Job!** (Alternating throughout this part of the task).

If incorrect, the picture of chocolate will flash and the voice on the iPad will say: **This is *chocolate.***

The screen will change to the chocolate picture and a voice on the iPad will ask: **Have you ever smelled *chocolate?***

Touch *yes* or *no* on the screen to indicate the child's answer, then touch NEXT at the bottom of the screen to go on to the next item. The answer choice can be changed between No and Yes until 'Continue' is pressed to advance to next screen. No Go Back is permitted in Picture Identification component.

Question 8: the voice on the iPad says: **Touch the picture of *bubble gum.***

If correct, the voice on the iPad will say: **That's right!** Or **Great Job!** (Alternating throughout this part of the task).

If incorrect, the picture of bubble gum will flash and the voice will say: **This is *bubble gum.***

The screen will change to the bubble gum picture and a voice on the iPad will ask: **Have you ever smelled *bubble gum*?**

Touch *yes* or *no* on the screen to indicate the child's answer, then touch NEXT at the bottom of the screen to go on to the next item. The answer choice can be changed between No and Yes until 'Continue' is pressed to advance to next screen. No Go Back is permitted in Picture Identification component.

At the end of these questions, the iPad screen will refresh and the voice on the iPad will ask the child to touch those pictures that were not correctly identified on the first trial.

These requests will be made one by one until all the items are presented with the instruction: '**Touch the picture of….'** There are no corrections in this part, nor are there questions about whether the child has smelled the item. Regardless of the child's performance on the picture identification task, the iPad will then move on to odor identification.

After this section, there is a button ***Touch and Hold Here to Continue*** at the bottom of the screen. Touch and hold that button to continue.

Part 2: Odor Identification:

Scratch 'n' Sniff Card Note: The odor on the card is strongest immediately after being scratched; the examiner may need to remind the participant to smell the card as quickly as possible after scratching it. If the child says he/she does not smell anything, the examiner should scratch the card one more time and place it directly under the child's nose, then ask the child to **make his/her best guess if he/she is not sure**.

For this age group, the examiner will scratch the card and hand it to the participant, saying:
I am going to give you some stickers to smell. After you have smelled the sticker, touch the picture that shows what you just smelled. If you want to change your choice, touch the hand, also called the GO BACK button. Let's begin.

If the child has difficulty touching the iPad screen, the examiner may register the participant's choice by touching the screen for him/her.

NOTE: The child is not permitted to go back beyond the last item he/she attempted; if the child attempts to go back beyond the previous item, say: **You can only go back to the last item you smelled.**

When the child has completed all five cards, say:

We are done with the smells.

The five odors presented are: *Lemon, Play Doh, Bubble Gum, Chocolate,* and *Popcorn*.

C.5.2.2 NIH Toolbox Odor Identification Test Instructions Ages 10+

The task is introduced with the following Title Screen: NIH Toolbox Odor Identification Test 10+. At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the test.

Instruction Screen:

The examiner says: **This task involves smelling various odors, one at a time, and then trying to identify them. The odors that you will smell are chosen from a variety of foods and objects that people experience in everyday life. We are using scratch 'n' sniff cards to present the odors.**

The examiner continues: **Take the scratcher and scratch the card. Smell it right after you scratch it, then look at the pictures on the screen. Touch the picture that best shows the odor you smelled on the card. A new set of pictures will then appear on the screen and you will be asked to identify the odor on the next card. If you want to change your last answer, touch the GO BACK button.**

(**NOTE:** For the first item, the GO BACK button is deactivated as there is no item before this one).

Scratch 'n' Sniff Card Note: The odor on the card is strongest immediately after being scratched. The examiner may need to remind the participant to smell the card as quickly as possible after scratching it. If the participant says he/she does not smell anything, the examiner should scratch the card one more time and place it directly under the participant's nose, then ask the participant to **make his/her best guess if he/she is not sure**.

The examiner should encourage the participant to smell the card more than once if needed.

If the participant has difficulty using the scratcher, the examiner may scratch the card and hand it to the participant. Similarly, if the participant has difficulty touching the iPad screen, the examiner may register the participant's choice by touching the screen for him/her.

The examiner should repeat the sequence of handing the cards to the participant to scratch, smell, and identify until all the cards have been used. For each trial, or as needed, repeat what was said above: **Take the scratcher and scratch this card; smell it, then look at the pictures on the screen. Touch the picture that best shows the odor that you smelled on the card. If you want to change your last answer, touch the GO BACK button.**

NOTE: The participant is not permitted to go back beyond the last item he/she attempted. If the participant attempts to go back beyond the previous item, say: **You can only go back to the last item you smelled.**

When the participant has completed all nine cards, say: **You have finished this activity.**

The nine odors presented are: *Lemon, Play Doh, Bubble Gum, Chocolate, Popcorn, Coffee, Smoke, Natural Gas,* and *Flower.*

C.5.3 NIH Toolbox Visual Acuity Test

This activity is intended to measure visual acuity in adults and children.

Testing will use different sets of optotypes (letters) for children and adults. For the **Visual Acuity Test,** the participant is seated **3 meters** away from the iPad and the display should be at eye level.

Equipment and materials needed:

- iPad
- Wireless keyboard (with extra AA batteries)
- Tablet stand
- Table
- Measuring tape
- Laminated HOTV letters for young children

Detailed information on equipment and materials needed for all tests can be found in Appendix 4.

Setting up Bluetooth Wireless Keyboard:

- Go to the Settings app of the iPad and make sure Bluetooth is turned on.
- Make sure the keyboard is in discovery mode by pressing the round button at the top right end of the keyboard and the small green light to the left of the button begins flashing.
- Select the Keyboard when it appears on the My Devices list on the iPad.
- When a pop up window appears on the iPad screen, follow the instructions and enter the required code on the keyboard.

  The usual keyboard on the iPad will not work when the external keyboard is working. To turn off the external keyboard, press the round button at the top right end of the keyboard, move at least 15 meters from the iPad with the keyboard, or touch the "information" button ⓘ on the iPad and touch "forget this device."

Before testing begins:

1. The examiner should move the iPad to a portable tablet stand that is placed on a table, or use another method such that the iPad is 3 meters from the participant and at eye level (this may also necessitate adjusting the participant's chair height).

2. It is recommended that the examiner have a printed copy of all instructions close at hand before beginning this measure. This is particularly important for the training and practice for the young children and may be important for older participants as well.

3. Alternatively, for adults and older children, the examiner may hold the iPad and read the initial instructional screens to the participant, after which the iPad should be placed on the stand. If using this procedure, the examiner should try to stay close to the participant while reading from the iPad (since explaining something from a distance of 3 meters may seem unusual and very different from other measures where the participant and

examiner are sitting side by side), and then walk over to the stand (3 meters away) and place the iPad on it before starting the items.

4. Since the participant's responses are recorded on the wireless keyboard, the wireless keyboard must be paired by Bluetooth with the iPad.

5. The examiner should ascertain if the participant wears corrective lenses for distance, and ensure he/she is wearing them. If the participant wears lenses but indicates he/she has forgotten them (or does not have them for any reason), the examiner may choose to continue testing or not; it is at the examiner's discretion. However, if the participant requires a very strong correction, testing without corrective lenses will not likely be valid. The examiner should note any such irregularities and, if testing is completed, should interpret results with caution.

iPad on stand

Visual Acuity set-up showing 3 meters distance

The examiner records the participant's response on the wireless keyboard; specifically, once the participant names (for young children, points on the HOTV sheet) the letter on the screen, the examiner types that letter into the keyboard. After typing the letter, the examiner presses the spacebar to move on to the next letter. The iPad software automatically scores the response and displays the next letter accordingly.

Age-Specific Instructions:

NIH Toolbox Visual Acuity Test Instructions Ages 3-7

NIH Toolbox Visual Acuity Test Instructions Ages 8+

C.5.3.1 NIH Toolbox Visual Acuity Test Instructions Ages 3-7

Before beginning the testing, set up the iPad on a stand that sits on a table, such that the iPad is 3 meters from the participant. Pair the wireless keyboard by Bluetooth with the iPad if it has not already been paired.

The task is introduced with the Title Screen: NIH Toolbox Visual Acuity Test 3-7. At the bottom of the screen is a button that instructs the examiner to Press the Spacebar to continue.

Because some children may not be able to name one or more of the letters **HOTV**, a laminated card is also used with young participants, allowing them to point to what they saw on the screen without verbalizing. The examiner should be seated next to the child so that he/she can see or hear what letter the child chooses.

A brief training is included before the test, followed by a practice, to assure that the child knows what needs to be done to complete the assessment. If the child does not succeed with the practice (as outlined below), testing should be discontinued.

Training:

Once the child is seated in a chair that is 3 meters from the iPad, say: **Now we are going to do an activity that shows us how well you can see pictures on the iPad screen.** Press Spacebar to continue.

Hand the child the laminated card and say: **Everything you will see is shown on this card. This is a picture of an H, this is a picture of an O, this is a picture of a T, and this is a picture of a V** (point to each letter while naming)**. Now, you try to name the pictures.**

Encourage the child to name the letters as best he/she can. If the child names all four letters correctly, say: **Good job.**

If any are named incorrectly, point to each letter and say ***only one time*** as before: **This is a picture of an H, this is a picture of an O, this is a picture of a T, and this is a picture of a V.** (Because letter naming is not required to complete the test, it is OK if the child does not correctly name each letter. Encourage the child's efforts without providing negative feedback.) Then say: **Let's do some more.** Press Spacebar to continue.

Say: **You are going to look on this screen** (point to iPad)**; then, you will see a picture or letter** (for children who clearly know the alphabet, it is OK to say letter instead of 'picture')**. Each time, I want you to tell me (or point on this card) what you saw on the screen. If you are not sure, it is OK to guess. Are you ready to start?** Press Spacebar to continue.

Practice:

The iPad will present one set of practice visual acuity trials (four letters) at a large size.

Rules:

a. If the child gets three or more correct, the program will continue automatically to visual acuity testing.

b. If the child misses two or more of four, review the laminated pointing chart and ask him/her to identify (either orally or by pointing) the four letters HOTV. If all are done correctly, see step c below. If child cannot correctly identify the optotypes on the HOTV set, repeat the training above one more time.

c. Proceed to a second practice trial set. If three or more of four are done correctly, proceed to live visual acuity testing.

d. If not, repeat (third practice trial set). If three or more are correct on the third practice trial, begin visual acuity testing. If two or more are incorrect, stop the test, since this is the third practice trial and the criterion of three or more of four correct is not achieved.

Visual Acuity Testing:

The examiner should say: **You did great. Now, the letters will get smaller and smaller until you cannot really see them. That is ok. We want to know how small they can get before you cannot see them.** Press Spacebar to continue.

Each time a letter is displayed, say: **Tell me or point to what you see.**

The examiner records the correctness of the participant's response on the wireless keyboard; specifically, once the participant names (for young children, points on the HOTV sheet) the letter on the screen, the examiner types that letter into the keyboard. After typing the letter, the examiner presses the spacebar to move on to the next letter.

The next item will not appear until the examiner has recorded the child's response to the item currently on screen. If the child is trying but struggling to verbalize the letters, remind him/her that pointing is OK, saying: **You can show me what you see.**

The test will progressively present smaller letters if the child answers correctly or larger ones if the child answers incorrectly, until an acuity score is established. The test will automatically end when the program has calculated the acuity score.

Note: If a child's Visual Acuity Test score is equivalent to 20/400 vision or worse, it suggests serious uncorrected distance vision deficits exist. A follow-up evaluation by a vision professional is suggested.

C.5.3.2 NIH Toolbox Visual Acuity Test Instructions Ages 8+

Before beginning the testing, set up the iPad on a stand that sits on a table, such that the iPad is 3 meters from the participant. Pair the wireless keyboard by Bluetooth with the iPad if it has not already been paired.

The task is introduced with the Title Screen: NIH Toolbox Visual Acuity Test 8+. At the bottom of the screen is a button that instructs the examiner to Press the Spacebar to continue.

Ask the participant if he/she wears glasses or contact lenses for distance vision. If the participant does wear lenses but indicates he/she has forgotten them (or does not have them for any reason), the examiner may choose to continue testing or not; it is at the examiner's discretion. Moreover, if the participant requires a very strong correction, testing will not likely be valid without the corrective lenses. The examiner should note any such irregularities and, if testing is completed in such a case, the results should be interpreted with caution.

Once the participant is seated in a chair that is 3 meters from the iPad, say: **Now we are going to do an activity where you will tell me what letters you see on the screen. You are going to look on this screen** (point to iPad**) and you will see a letter. Each time, I want you to tell me the letter you saw on the screen. If you are not sure, it is OK to guess. The letters will get smaller and smaller until you cannot really see them. That is ok. We are trying to determine how small they can get before you cannot see them. Are you ready to start?** Press Spacebar on keyboard to continue.

Visual Acuity Test (with glasses or contact lenses if usually worn for distance vision): The examiner should record the participant's response on the keyboard by entering the letter said.

Each time a letter is displayed, say: Tell me what you see. At the examiner's discretion, this can be replaced by: Go ahead after a few letters have been displayed.

The examiner records the participant's response on the wireless keyboard; specifically, once the participant names the letter on the screen, the examiner types that letter into the keyboard. After typing the letter, the examiner presses the spacebar to move on to the next letter. The iPad software will automatically score the response and present the next item accordingly.

The next item will not appear until the examiner has recorded the participant's response to the item currently on screen. The test will progressively present smaller letters if the participant answers correctly or larger ones if the participant answers incorrectly, until an acuity score is established. The test will automatically end when the program has calculated the acuity score.

Note: If a participant's Visual Acuity Test score is equivalent to 20/400 vision or worse, it suggests serious uncorrected distance vision deficits exist. A follow-up evaluation by a vision professional is suggested.

C.5.4 NIH Toolbox Words-in-Noise Test

This measure quantifies a participant's ability to hear words in a noisy environment.

Equipment and materials needed:

- iPad
- Sennheiser HD201 headphones or similar

Detailed information on equipment and materials needed for all tests can be found in Appendix 4.

A female speaker instructs the participant to a say a one-syllable word while in the background, there is the noise of multiple people speaking at the same time. At the beginning of the test, the speaker's voice is much louder than the background noise; as the test progresses, the speaker's voice gradually becomes softer and eventually is the same level as the background noise.

There are seven levels of word/noise ratios and five words at each level. Each ear is tested separately and the test is concluded when a participant cannot repeat any of the five words at a given level in each ear separately.

Each screen represents a different background noise level and on each, the examiner touches the word(s) that the participant correctly identifies. If the participant correctly repeats at least one word at a level, the audio files will continue to present words to that ear. If all five words at a given level are incorrect, the iPad will begin testing the second ear.

For the second ear, a series of five words will appear on the iPad screen as before and the associated audio files will play in the participant's earphones. If all five words at a given level are incorrect for the second ear, the examiner should touch the **FINISH** button.

If the participant repeats some words correctly from each of the seven levels, after all the levels have been presented, the examiner should touch the **FINISH** button.
The computer will automatically score the participant's performance.

NOTE If a participant wears hearing aids, they should be removed for the duration of this test.

NOTE Before a testing session, the examiner should confirm that the iPad volume is turned ON and set to a mid-range level (i.e., a comfortable listening level).

C.5.4.1 NIH Toolbox Words-in-Noise Test Instructions Ages 6+

The test begins with a Title Screen: NIH Toolbox Words-in-Noise Test 6+. At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the test.

Before placing the headphones on the participant's head, the examiner should make sure that he/she can see the participant's face and hear his/her responses; at the same time, the participant should **not** be able to read the iPad screen.

Since the headphones will block communication between the examiner and the participant, the examiner should instruct the participant that if he/she does not hear anything in the headphones, he/she should take them off and the examiner will try to rectify the situation (most likely by pressing the button on the side of the iPad to increase the volume).

The examiner should introduce the task, reading the screen: **You will hear a woman asking you to repeat various words. Repeat the words she asks out loud so that I can hear you. For example, if you hear her say, 'Say the word dog,' you would say, 'dog.' If you are not sure what she said, just say what you think you heard. You will also hear people talking in the background. Do your best to ignore them and to focus on the woman's voice asking you to repeat the words. You will hear words in only one ear and then in the other. Do you have any questions?** Answer any questions and say: **Let's begin.**

The examiner should place the earphones on the participant's head, making sure that the right earphone is over the right ear and the left earphone is over the left ear.

Touch the button at the bottom of the screen that says ***Touch and Hold Here to Continue***. This will start the test.

First Ear:
A series of five words will appear on the iPad screen, along with the current dB level and the ear being tested. The associated audio files will play in the participant's earphones. The examiner should listen carefully to the participant's responses and touch any word that is said correctly. **Incorrect words are not marked.**

Each screen represents a different background noise level and on each, the examiner touches the word(s) that the participant correctly identifies. If the participant correctly repeats at least one word at a level, the audio files will continue to present words to that ear. If all five words at a given level are incorrect, the iPad will begin testing the second ear.

Second Ear:
As before, a series of five words will appear on the iPad screen, along with the current dB level and the ear being tested. The associated audio files will play in the participant's earphones. The examiner should listen carefully to the participant's responses and touch any word that is said correctly.

If the participant correctly repeats at least one word at a level, the audio files will continue to present words to that ear. **Incorrect words are not marked.** If all five words at a given level are incorrect, the iPad will stop playing the audio files, at which point the examiner should touch the **FINISH** button.

If the participant repeats some words correctly from each of the seven levels, after all the audio files are presented, the examiner should touch the **FINISH** button.

The iPad will automatically score the participant's performance.

C.5.5 NIH Toolbox Regional Taste Intensity Test

This activity assesses a participant's sensitivity to bitter and salty solutions in the mouth generally, as well as specifically on the tip of the tongue. *The participants should not have had drinks or food in the 30 minutes prior to the testing.*

All the instructions are shown on the iPad. The participant's responses are registered directly on the iPad screen using a calibrated scale that ranges from ***No sensation*** to ***Strongest sensation of any kind***.

Initially the participant is taught to use the scale and then is asked to rate the solutions as they are presented in different areas of the mouth using the same scale.

This activity requires more preparation and uses more materials than other tests; the examiner needs to have the following equipment nearby before beginning the test:

- iPad with stand (to minimize the possibility that liquid gets on the iPad)
- Laminated pictures of procedure
- Gloves (latex free)
- 2 sterile cotton swabs
- Bottle of purified water at room temperature
- Disposable cup for each participant
- Cup, basin, spittoon, or sink for spitting solutions and rinse water
- Quinine solution in small cups**
- Salt solution (NaCl) in small cups**

****The equipment needed and instructions for mixing the Salt and Quinine Solution are provided in Appendix 7.** In the past, these were produced by a third party; that party is no longer producing the solutions. The solutions can be mixed by any user or third party having the appropriate equipment to do so. Most pharmacies and some universities have the necessary equipment and supplies to produce the solutions.

C.5.5.1 NIH Toolbox Regional Taste Intensity Test Instructions Ages 12+

The task is introduced with the following Title Screen: NIH Toolbox Regional Taste Test 12+. At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the test.

The iPad should be positioned so that both the examiner and the participant can see the screen, since all instructions are on the screen and read together by both parties.

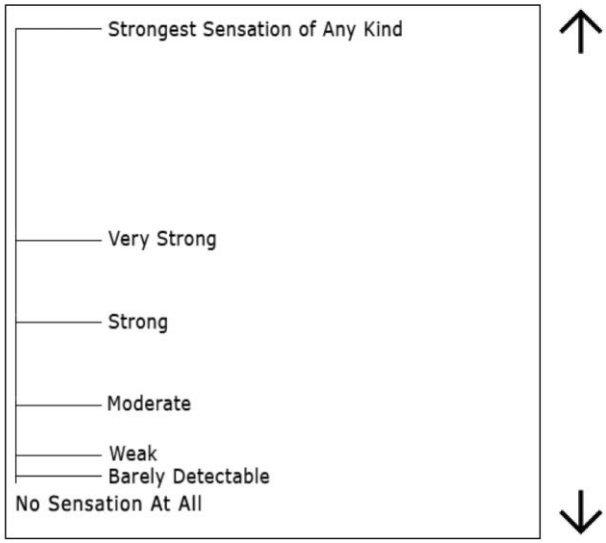
Say: **Now I am going to test your sense of taste. To do this, we will be using a salty flavor and a flavor found in tonic water.** Touch and hold button at the bottom of the screen to move to next screen.

Demonstration of the scale:

Say: **Before the tasting, I am going to ask you to use this scale to rate how weak or strong some sensations are to you. Some of these sensations are things that you will experience. Some of these sensations are what you will recall experiencing in the past.**

Continue: **This scale ranges from 'no sensation' at the bottom to the 'strongest sensation of any kind' at the top. The top of the scale** (Strongest Sensation of Any Kind) **refers to any kind of experience, for example sound, brightness of light, even those sensations that might be painful.** Touch and hold button at the bottom of the screen to advance to the next screen.

Point to the scale on the screen and use one finger to indicate the bottom to the top, saying, **This is how you use this scale.** Demonstrate how the participant can use his/her finger on the scale. Then touch and hold button at the bottom of the screen to advance to the next screen.



Demonstration continued: Show the scale and say: You can use your finger to choose a word on the scale that describes what you experience or what you remember. You can touch anywhere on the line. For example, if the sensation you experience is more than 'moderate' but not quite 'strong,' you can use your finger to touch a spot between moderate and strong. Demonstrate for the participant.

Then say: **Move your finger until you think it best represents how you feel, and then remove your finger. If you like, you can fine-tune your rating by using the up and down arrows to the right of the scale. When you are happy with the position of the mark, touch the OK button**.

Once the participant has touched the OK button, the practice screens appear preceded by a screen that the examiner reads: **Let's try some examples.** The scale on the screen will no longer have instructions on it. The examiner should touch and hold button at the bottom of the screen to advance to the next screen.

Practice Screen 1: Say: **Use this scale to rate the brightness of a well-lit room. How strong or intense is the brightness to you? When you are finished, touch the OK button.**

Practice Screen 2: Say: **Please remember the brightness of a dimly lit restaurant, where the only light is from candles on the table. Would you say the intensity of a dimly lit restaurant is less bright or brighter than the light in a well-lit room? Use the scale to rate the brightness of a dimly lit restaurant. When you are finished, touch the OK button.**

Practice Screen 3: Say: **Now think about the brightest light you have ever seen. Use the scale to rate the intensity or strength of the brightest light you have ever seen. When you are finished, touch the OK button.**

> If a participant has difficulty touching the screen, he/she may point and the examiner may touch. The examiner should say something like the following to the participant: **You can point to your choice and then I can touch the screen for you.**

Test Items:

There are four trials: quinine on the tongue tip, salt on the tongue tip, quinine in the whole mouth, and salt in the whole mouth. The examiner should follow the prescribed order.

Preparation for test items: Read: **Now we are going to do the taste test. Before we begin, please rinse out your mouth two times with the bottled water and then spit the rinse water into this container (show container).**

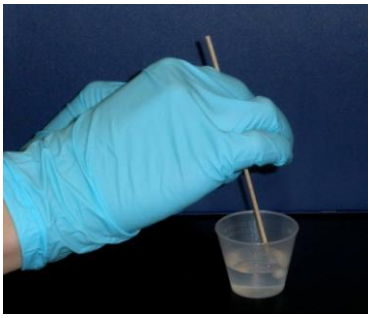
Continue: **Now, I am going to ask you to rate the strength of these tastes. First, I will put some of the solution across the tip of your tongue and ask for a rating. To begin, I will put on these gloves.** (See steps below).

Step 1: The examiner should *put on gloves* for the remainder of this measure.

Step 2: Say: **Then, I will put this sterile cotton swab into the solution.** Put the swabs into the cups of solution.

The examiner should touch and hold button at the bottom of the screen to advance to next screen.

Step 1



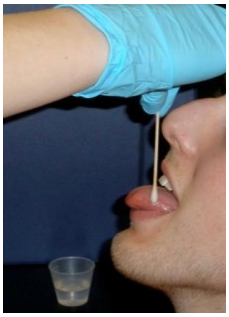
Step 2

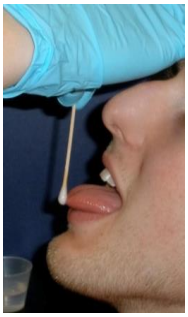
Step 3

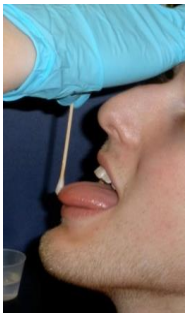
Test item 1:

Say: **Now hold your tongue out.** If the participant has difficulty doing this, show him/her the picture or demonstrate**.** Say: **I am going to start on your left side and gently put some solution across the tip of your tongue.**

The examiner should carefully and gently apply the solution in a slow, continuous motion from the left side of the tongue across the tip and finishing on the right side of the tongue.







Move from left side to the middle to the right side.

Using the cotton swab, paint the *quinine* on the tip of the tongue as described earlier, and say: **Now, show me the strength or intensity of the taste on the scale you used before. Keep your tongue out while you make the rating on the scale. Touch the OK button when you are finished. If you should accidentally swallow any, it will not hurt you.**

Transition screen 1:

Have the participant rinse out his/her mouth with the bottled water between Items 1 and 2 and read: **Please rinse out your mouth two times with the bottled water and spit the rinse water into this container.**

The examiner should touch and hold button at the bottom of the screen to advance to next screen.

Test Item 2:

Read: **Now hold your tongue out again. I am going to gently put some solution across the tip of your tongue.** Using the cotton swab, paint the *salt solution (NaCl)* on the tip of the tongue as described earlier, and say: **Now, show me the strength or intensity of the taste on the scale you used before. Keep your tongue out while you make the rating on the scale. Touch the OK button when you are finished. If you should accidentally swallow any, it will not hurt you.**

Transition screen 2:

Have the participant rinse out his/her mouth with the bottled water between Items 2 and 3 and read: **Please rinse out your mouth two times with the bottled water and spit the rinse water into this container.**

The examiner should touch and hold button at the bottom of the screen to advance to next screen.

Test Item 3:

Hand the participant a small cup with *quinine* and say: **Next, I would like you to sip all the solution in this cup. Try not to drink the solution, but hold it and gently move it around in your mouth until I tell you to spit it out in this container. If you should accidentally swallow any, it will not hurt you.**

After the participant sips the solution, the examiner should count for three seconds (one-thousand-one, one-thousand-two, one-thousand-three), and then say: **Spit out the solution in your mouth and swallow whatever remains. Then, rate the strength or intensity of the taste on the same scale you used before. Touch the OK button when you are finished.**

Transition screen 3:

Have the participant rinse out his/her mouth with the bottled water between Items 4 and 4 and say: **Please rinse out your mouth two times with the bottled water and spit the rinse water into this container.**

The examiner should touch and hold button at the bottom of the screen to advance to next screen.

Test Item 4:

Hand the participant a small cup with *salt solution (NaCl)* and say: **Next, I would like you to sip all the solution in this cup. Try not to drink the solution, but hold it and gently move it around in your mouth until I tell you to spit it out in this container. If you should accidentally swallow any, it will not hurt you.**

After counting one-thousand-one, one-thousand-two, one-thousand-three once the participant has sipped the solution, the examiner should say: **Spit out the solution in your mouth and swallow whatever remains. Then, rate the strength or intensity of the taste on the same scale you used before. Touch the OK button when you are finished.**

Final Screen:

After the last item is administered, give the participant the bottle of water and encourage him/her to drink it and/or rinse some more. The examiner should say: **Now that we have finished, you might want to drink some more water to clean out your mouth.**

The examiner should touch and hold button at the bottom of the screen to advance to next screen.

The participant may be offered a candy to help overcome any remaining taste in his/her mouth.

(Sugar-free candy may be needed for diabetic participants)

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2. User may not make modifications to any component of NIH Toolbox without written consent of NU/NIH.

3. All modifications should be fully validated against the existing NIH Toolbox measure(s) on which they were based. Plans for a concurrent validation study must be included in the written request for modifications. If no validation study is planned, this must be noted in the written request, along with an explanation.

4. User must send validation study results to NU/NIH for review prior to publication citing any results of said study or any results citing use of NIH Toolbox.

5. NU/NIH will review validation study data and will inform User if modification to NIH Toolbox measure(s) constitute an “Approved Adaptation” or a “Non-Validated Adaptation” of NIH Toolbox. NU/NIH will update NIHToolbox.org accordingly to inform other users and prospective users of these modifications, along with contact information for the lead researcher.

6. User must cite NIH Toolbox in any and all presentations, publications, or other third-party sharing of research data, indicating whether any measures used constitute Approved Adaptations or Non-Validated Adaptations. The citation must include the following statement: “All NIH Toolbox-related materials are ©2015 Northwestern University and the National Institutes of Health.”

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2. Test questions are not to be reproduced or paraphrased in any way.
3. Access to test materials must be limited to qualified persons with a responsible, professional interest who agree to safeguard their use.
4. Test materials and scores may be released only to persons qualified to interpret and use them properly.

If a test taker or the parent of a child who has taken a test wishes to examine test responses or results, the parent or test taker may be permitted to review the test and the test answers in the presence of a representative of the school, college, or institution that administered the test. Such review should not be permitted in those jurisdictions where applicable laws require the institution to provide a photocopy of the test subsequent to review. If you are not certain of the effect of the laws in jurisdiction, please contact your jurisdiction's professional organization.

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Appendix 2 – Determining Handedness

If a participant does not know or cannot tell the examiner his/her handedness, the following questions should be used to determine it:

a. Which foot do you use to kick a ball? Left/Right

b. Which hand do you use to pick up and throw a ball? Left/Right

c. Which hand do you use to write or draw? Left/Right

Whichever is selected at least two times, from the above three questions (right or left) is determined to be the dominant hand.

Appendix 3 – Pausing, Stopping, Resuming Rules

Different instruments may behave differently if "Resume Instrument" is selected. In most cases, users will be taken back to where they were before pausing the assessment. In some cases (e.g., timed tests), users will be taken back to the beginning of the instrument. In select cases, an instrument may not be restarted once paused. Detailed rules for skipping, pausing or stopping each test are provided below.

Cognition

NIH Toolbox Picture Vocabulary Test

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - Return to active screen; pause not recorded in data
  - During Live Items
    - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - Return to active screen; pause not recorded in data
  - During Live Items
    - Participant sees item equivalent to last item shown. Dichotomous engine will find the un-administered item whose difficulty setting is closest to the user's theta, which will be used for restarting. On restart, the engine is provided with the user's existing theta score (instead of the starting theta value).

NIH Toolbox Flanker Inhibitory Control and Attention Test

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.

- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - Return to active screen; pause not recorded in data
  - During Live Items
    - Return to active screen; pause not recorded in data

- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
    - During instructions
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Practice
        - Participant sees last practice item not responded to.
    - During Live Items
        - Participant sees last live item not responded to.

NIH Toolbox List Sorting Working Memory Test

- Skip
    - Resume not allowed- mark instrument as "completed,” go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting ‘stop’ or ‘skip’)
    - During Instructions
        - Return to active screen; pause not recorded in data
    - During Practice
        - Participant sees last live item not responded to.
    - During Live Items
        - Participant sees last live item not responded to.
- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
    - During instructions
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Practice
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Live Items
        - Participant sees last live item not responded to. This restart will also always play the list’s introduction screen before showing the screens again.

NIH Toolbox Dimensional Change Card Sort Test

- Skip
    - Resume not allowed- mark instrument as "completed,” go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting ‘stop’ or ‘skip’)
    - During Instructions
        - Return to active screen; pause not recorded in data
    - During Practice
        - Return to active screen; pause not recorded in data
    - During Live Items
        - Return to active screen; pause not recorded in data

- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
    - During instructions
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Practice
        - Participant sees last practice item not responded to.
    - During Live Items
        - Participant sees last live item not responded to.

NIH Toolbox Pattern Comparison Processing Speed Test

- Skip
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting ‘stop’ or ‘skip’)
    - During Instructions
        - Return to active screen; pause not recorded in data
    - During Practice
        - Participant sees last live item not responded to.
    - During Live Items
        - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable).
- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
    - During instructions
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Practice
        - Participant sees last live item not responded to.
    - During Live Items
        - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable).

NIH Toolbox Picture Sequence Memory Test

- Skip
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting ‘stop’ or ‘skip’)
    - During Instructions
        - Return to active screen; pause not recorded in data
    - During Practice
        - Return to active screen; pause not recorded in data
    - During Live Items
        - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
    - During instructions
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Practice
        - If the user stops during the first practice item, they will return to the start of the instrument. If the user stops during the second practice item they will return to the last sequence they did not respond to; this includes that sequence’s introduction.
    - During Live Items
        - If the user stops during a live item, they will return to the last sequence they did not respond to; this includes that sequence’s introduction.

NIH Toolbox Oral Reading Recognition Test

- Skip
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting ‘stop’ or ‘skip’)
    - During Instructions
        - Return to active screen; pause not recorded in data
    - During Practice
        - NO PRACTICE IN OR
    - During Live Items
        - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
    - During instructions
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Practice
        - NO PRACTICE IN OR
    - During Live Items
        - Participant sees item equivalent to last item shown. Dichotomous engine will find the un-administered item whose difficulty setting is closest to the user’s theta, which will be used for restarting. On restart, the engine is provided with the user’s existing theta score (instead of the starting theta value).

Emotion

Emotion Fixed Form

- Skip
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting ‘stop’ or ‘skip’)
    - During Instructions
        - Return to active screen; pause not recorded in data
    - During Practice
        - NO PRACTICE IN EMOTION
    - During Live Items
        - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
    - During instructions
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Practice
        - NO PRACTICE IN EMOTION
    - During Live Items
        - Participant sees last live item not responded to.

Emotion CAT

- Skip
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting ‘stop’ or ‘skip’)
    - During Instructions
        - Return to active screen; pause not recorded in data
    - During Practice
        - NO PRACTICE IN EMOTION
    - During Live Items
        - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
    - During instructions
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Practice
        - NO PRACTICE IN EMOTION
    - During Live Items
        - Participant sees item equivalent to last item shown

Motor

NIH Toolbox 9-Hole Pegboard Dexterity Test

- Skip
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
    - During Instructions
        - Return to active screen; pause not recorded in data
    - During Practice
        - Return to active screen; pause not recorded in data
    - During Live Items
        - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
    - During instructions
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Practice
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Live Items
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.

NIH Toolbox Grip Strength Test

- Skip
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
    - During Instructions
        - Return to active screen; pause not recorded in data
    - During Practice
        - Return to active screen; pause not recorded in data
    - During Live Items
        - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
    - During instructions
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Practice
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Live Items
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.

NIH Toolbox Standing Balance Test

- Skip
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
    - During Instructions
        - Return to active screen; pause not recorded in data
    - During Practice
        - Return to active screen; pause not recorded in data
    - During Live Items
        - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable).
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
    - During instructions
        - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable).
    - During Practice
        - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable).
    - During Live Items
        - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable).

NIH Toolbox 4-meter Walk Gait Speed Test

- Skip
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
    - During Instructions
        - Return to active screen; pause not recorded in data
    - During Practice
        - Return to active screen; pause not recorded in data
    - During Live Items
        - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
    - During instructions
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Practice
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Live Items
        - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted

NIH Toolbox 2-Minute Walking Endurance Test

- Pause (perform admin gesture, and return to instrument without selecting ‘stop’ or ‘skip’)
    - During Instructions
        - Return to active screen; pause not recorded in data
    - During Practice
        - NO PRACTICE ITEMS IN ENDURANCE TEST
    - During Live Items
        - Resume not allowed- mark instrument as "completed", go to next instrument (if applicable). Can never be restarted
- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
    - During instructions
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Practice
        - NO PRACTICE ITEMS IN ENDURANCE TEST
    - During Live Items
        - Resume not allowed- mark instrument as "completed", go to next instrument (if applicable). Can never be restarted

Sensation

NIH Toolbox Pain Intensity Fixed Form

- Skip
    - Resume not allowed- mark instrument as "completed,” go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting ‘stop’ or ‘skip’)
    - During Instructions
        - Return to active screen; pause not recorded in data
    - During Practice
        - NO PRACTICE IN PAIN INTENSITY
    - During Live Items
        - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
    - During instructions
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Practice
        - NO PRACTICE IN PAIN INTENSITY
    - During Live Items
        - Participant sees last live item not responded to.

NIH Toolbox Pain Interference CAT

- Skip
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting ‘stop’ or ‘skip’)
    - During Instructions
        - Return to active screen; pause not recorded in data
    - During Practice
        - NO PRACTICE IN PAIN INTERFERENCE
    - During Live Items
        - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
    - During instructions
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Practice
        - NO PRACTICE IN PAIN INTERFERENCE
    - During Live Items
        - Participant sees item equivalent to last item shown

NIH Toolbox Odor Identification Test

- Skip
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting ‘stop’ or ‘skip’)
    - During Instructions
        - Return to active screen; pause not recorded in data
    - During Practice
        - Return to active screen; pause not recorded in data
    - During Live Items
        - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
    - During instructions

        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Practice
        - Participant sees last practice item not responded to.
    - During Live Items
        - Participant sees last live item not responded to.

NIH Toolbox Visual Acuity Test

- Skip
    - Resume not allowed – mark instrument as “completed,” go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting ‘stop’ or ‘skip’)
    - During Instructions
        - Return to active screen; pause not recorded in data
    - During Practice/Screening
        - Return to active screen; pause not recorded in data
    - During Live Items
        - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
    - During instructions
        - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
    - During Practice/Screening
        - Participant sees item from last optotype size not responded to.
    - During Live Items
        - Participant sees item equivalent to last item shown.

NIH Toolbox Words-In-Noise Test

- Skip
    - Resume not allowed- mark instrument as "completed,” go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting ‘stop’ or ‘skip’)
    - During Instructions
        - Return to active screen; pause not recorded in data
    - During Practice
        - NO PRACTICE ITEMS IN WIN TEST

- During Live Items
  - Participant sees last live item not responded to.
- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
  - During instructions
    - Resume not allowed- mark instrument as "completed,” go to next instrument (if applicable). Can never be restarted
  - During Practice
    - NO PRACTICE ITEMS IN WIN TEST
  - During Live Items
    - Resume not allowed- mark instrument as "completed,” go to next instrument (if applicable). Can never be restarted

NIH Toolbox NIH Toolbox Regional Taste Intensity Test

- Skip
  - Resume not allowed- mark instrument as "completed,” go to next instrument (if applicable). Can never be restarted.

- Pause (perform admin gesture, and return to instrument without selecting ‘stop’ or ‘skip’)
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - Return to active screen; pause not recorded in data
  - During Live Items
    - Return to active screen; pause not recorded in data

- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Live Items
    - Participant sees last live item not responded to.

Appendix 4 – NIH Toolbox Equipment and Materials

In most cases when using the NIH Toolbox app, all you will need to administer the tests and surveys to participants is an iPad. However, there are some additional supplies needed for the cognition, motor and sensation instruments as outlined below. Keep in mind the following guidelines when purchasing additional supplies:

1. Unless recommended otherwise, all materials and equipment can be purchased from any vendor of your choosing.
2. Adhere to the minimum requirements for the materials and equipment where applicable.
3. Some materials and equipment can be reused for multiple tests (e.g., Bluetooth wireless keyboard).
4. Vendors may provide discounts for educational institutions, non-profits, etc.

General recommended equipment and materials:
An iPad case that allows for different viewing angles and provides protection is recommended. The links below provide examples of recommended cases, for use during administration of any or all instruments:

1. http://www.otterbox.com/en-us/ipad-cases

2. http://www.logitech.com/en-us/product/blok-protective-case?wt.ac_id=global_news_blokcase_081515

If a less expensive alternative is desired (and young children are not being tested), here is a link to an example of a recommended case:
http://www.apple.com/shop/product/MGTM2ZM/A/ipad-air-smart-cover-black?fnode=a87dbdead2a27022cf9ab0e35304a975132e244355b424ba4a40d2b00bedcc62c3e99c0671951dea0e39b200113ed409bda611c17ef86559beeb743d176f9bf428f3847c4c361f27c478b04af1540e623b25db8c477687d51c63802fa11df130e4e7decbc26fddbde805d751bbf55deb

NIH Toolbox Cognition instruments additional equipment and materials:

Instrument	Equipment and Materials	Vendor Suggestion	Approximate Cost
NIH Toolbox Picture Vocabulary Test	None	---	---
NIH Toolbox Flanker Inhibitory Control and Attention Test	Home Base	Download from NIH Toolbox Website	Free
NIH Toolbox List Sorting Working Memory Test	Bluetooth Wireless Keyboard	Apple Store	$69.00
	Extra AA batteries for the keyboard	Any	Varies
	NIH Toolbox List Sorting Working Memory Test Examiner Answer Sheet	Contact cognition@nihtoolbox.org	Free
NIH Toolbox Dimensional Change Card Sort Test	Home Base	Download from NIH Toolbox Website	Free
NIH Toolbox Pattern Comparison Processing Speed Test	None	---	---
NIH Toolbox Picture Sequence Memory Test	None	---	---
NIH Toolbox Oral Reading Recognition Test	Bluetooth Wireless Keyboard	Apple Store	$69.00
	Extra AA batteries for the keyboard	Any	Varies
	NIH Toolbox Oral Reading Recognition Test Training and Certification Materials	Contact cognition@nihtoolbox.org	Free

NIH Toolbox Emotion instruments additional equipment and materials:

None

NIH Toolbox Motor instruments additional equipment and materials:

Instrument	Equipment/Materials	Vendor Suggestion	Approximate Cost
NIH Toolbox 9-hole Pegboard Dexterity Test	Jamar® 9-Hole Peg Test Kit (item number A8515) (also known as Rolyan 9-hole Peg Test Kit)	Patterson Medical	$80.75
	Jamar® 9-Hole Peg Test Kit Replacement Pegs (item number A8516)	Patterson Medical	$11.65
NIH Toolbox Grip Strength Test	Jamar® Plus+ Digital Hand Dynamometer (item number 563213)	Patterson Medical	$363.55
NIH Toolbox Standing Balance Test	iPod touch (5th generation or later)	Apple Store	$199.00
	Griffin Survivor protective case (part # 3611154) or similar	CDW	Varies
	AIREX Balance Pad Elite (item number ARX-23431)	Medex Supply or Amazon	$69.00
	Scott Gait Belt w/Velcro (item number 177 0089, various sizes)	Promedxpress	$14.99-19.99
	Sanitary booties	Any	Varies
NIH Toolbox 4 Meter Walk Gait Speed Test and 2-Minute Walk Endurance Test	Measuring tape with meters and feet	Any. Sufficient to set up a 50' walking course.	Varies
	Set of 2 cones	Any. Small plastic cones..	Varies
	Walking course set up diagram.	See Appendix 6	Free
	Colored masking tape to set up the walking course	Any	Varies

NIH Toolbox Sensation instruments additional equipment and materials:

Instrument	Equipment/Materials	Vendor Suggestion	Approximate Cost
NIH Toolbox Pain Interference Test	None	---	---
NIH Toolbox Pain Intensity Test	None	---	---
NIH Toolbox Odor Identification Test	NIH Toolbox Odor Identification Cards	Download ordering instructions from NIH Toolbox Website	Varies by the size of the order
	Scratcher (e.g., guitar pick)	Any	$0.25
NIH Toolbox Visual Acuity Test	Belkin Portable Tablet Stage or similar	www.cdw.com	$97.99
	Bluetooth Wireless Keyboard	Apple Store	$69.00
	Table	Any	Varies
	Measuring Tape	Any	Varies
	Laminated HOTV letters for young children	Download here	Free
NIH Toolbox Words-in-Noise (WIN) Test	Sennheiser HD201 headphones or any others that meet or exceed these specifications: **Bandwidth/Frequency Response:** 10 Hz – 10,000 Hz Isolation = 10 dB or **Greater Sensitivity**: 96 dB SPL/V or greater. **Standard phone/laptop plug** (3.5 mm)	Any vendor or Headphone.com	Varies. Approximately $30.00
NIH Toolbox Regional Taste Test	Please refer to Appendix 7 for the detailed list of materials		

Appendix 5 – Key to Instrument Name Abbreviations

Title screen displayed in the app	Corresponding Instrument Name
NIH Toolbox Touch Screen Tutorial 3+	NIH Toolbox Touch Screen Tutorial Age 3+
NIH Toolbox PVT 3+	NIH Toolbox Picture Vocabulary Test Age 3+ v**2.0**
NIH Toolbox OR 3+	NIH Toolbox Oral Reading Recognition Test Age 3+ v2.0
NIH Toolbox LS 7+	NIH Toolbox List Sorting Working Memory Test Age 7+ v2.0
NIH Toolbox PC 7+	NIH Toolbox Pattern Comparison Processing Speed Test Age 7+ v2.0
NIH Toolbox PSM 3-4 Form A	NIH Toolbox Picture Sequence Memory Test Ages 3-4 Form A v2.0
NIH Toolbox PSM 3-4 Form B	NIH Toolbox Picture Sequence Memory Test Ages 3-4 Form B v2.0
NIH Toolbox PSM 3-4 Form C	NIH Toolbox Picture Sequence Memory Test Ages 3-4 Form C v2.0
NIH Toolbox PSM 5-6 Form A	NIH Toolbox Picture Sequence Memory Test Ages 5-6 Form A v2.0
NIH Toolbox PSM 5-6 Form B	NIH Toolbox Picture Sequence Memory Test Ages 5-6 Form B v2.0
NIH Toolbox PSM 5-6 Form C	NIH Toolbox Picture Sequence Memory Test Ages 5-6 Form C v2.0
NIH Toolbox PSM 7 Form A	NIH Toolbox Picture Sequence Memory Test Age 7 Form A v2.0
NIH Toolbox PSM 7 Form B	NIH Toolbox Picture Sequence Memory Test Age 7 Form B v2.0
NIH Toolbox PSM 7 Form C	NIH Toolbox Picture Sequence Memory Test Age 7 Form C v2.0
NIH Toolbox PSM 8+ Form A	NIH Toolbox Picture Sequence Memory Test Age 8+ Form A v2.0
NIH Toolbox PSM 8+ Form B	NIH Toolbox Picture Sequence Memory Test Age 8+ Form B v2.0
NIH Toolbox PSM 8+ Form C	NIH Toolbox Picture Sequence Memory Test Age 8+ Form C v2.0
NIH Toolbox FL 3-7	NIH Toolbox Flanker Inhibitory Control and Attention Test Ages 3-7 v2.0
NIH Toolbox FL 8-11	NIH Toolbox Flanker Inhibitory Control and Attention Test Ages 8-11 v2.0
NIH Toolbox FL 12+	NIH Toolbox Flanker Inhibitory Control and Attention Test Age 12+ v2.0
NIH Toolbox DCCS 3-7	NIH Toolbox Dimensional Change Card Sort Test Ages 3-7 v2.0
NIH Toolbox DCCS 8-11	NIH Toolbox Dimensional Change Card Sort Test Ages 8-11 v2.0

Title screen displayed in the app	Corresponding Instrument Name
NIH Toolbox DCCS 12+	NIH Toolbox Dimensional Change Card Sort Test Age 12+ v2.0
NIH Toolbox 4-Meter Walk Gait Speed Test 7+	NIH Toolbox 4-Meter Walk Gait Speed Test Age 7+ v2.0
NIH Toolbox 9-Hole Pegboard Dexterity Test 3+	NIH Toolbox 9-Hole Pegboard Dexterity Test Age 3+ v2.0
NIH Toolbox Grip Strength Test 3+	NIH Toolbox Grip Strength Test Age 3+ v2.0
NIH Toolbox Standing Balance Test 3-6	NIH Toolbox Standing Balance Test Ages 3-6 v2.0
NIH Toolbox Standing Balance Test 7+	NIH Toolbox Standing Balance Test Age 7+ v2.0
NIH Toolbox 2-Minute Walk Endurance Test 3+	NIH Toolbox 2-Minute Walk Endurance Test Age 3+ v2.0
NIH Toolbox Odor Identification Test 10+	NIH Toolbox Odor Identification Test Age 10+ v2.0
NIH Toolbox Odor Identification Test 3-9	NIH Toolbox Odor Identification Test Ages 3-9 v2.0
NIH Toolbox Words-In-Noise Test 6+	NIH Toolbox Words-In-Noise Test Age 6+ v2.1
NIH Toolbox Regional Taste Test 12+	NIH Toolbox Regional Taste Intensity Test Age 12+ v2.0
NIH Toolbox Visual Acuity Test 3-7	NIH Toolbox Visual Acuity Test Ages 3-7 v2.0
NIH Toolbox Visual Acuity Test 8+	NIH Toolbox Visual Acuity Test Age 8+ v2.0
NIH Toolbox Dynamic Visual Acuity Test 3-7	NIH Toolbox Dynamic Visual Acuity Test Ages 3-7 v2.0
NIH Toolbox Dynamic Visual Acuity Test 8+	NIH Toolbox Dynamic Visual Acuity Test Age 8+ v2.0
NIH Toolbox Pain Intensity FF Age 18+	NIH Toolbox Pain Intensity FF Age 18+ v2.0
NIH Toolbox Pain Interference CAT Age 18+	NIH Toolbox Pain Interference CAT Age 18+ v2.0
NIH Toolbox Touch Screen Tutorial 3+	NIH Toolbox Touch Screen Tutorial Age 3+
NIH Toolbox PVT 3+	NIH Toolbox Picture Vocabulary Test Age 3+ v**2.0**
NIH Toolbox OR 3+	NIH Toolbox Oral Reading Recognition Test Age 3+ v2.0
NIH Toolbox LS 7+	NIH Toolbox List Sorting Working Memory Test Age 7+ v2.0
NIH Toolbox PC 7+	NIH Toolbox Pattern Comparison Processing Speed Test Age 7+ v2.0
NIH Toolbox PSM 3-4 Form A	NIH Toolbox Picture Sequence Memory Test Ages 3-4 Form A v2.0
NIH Toolbox PSM 3-4 Form B	NIH Toolbox Picture Sequence Memory Test Ages 3-4 Form B v2.0

Title screen displayed in the app	Corresponding Instrument Name
NIH Toolbox PSM 3-4 Form C	NIH Toolbox Picture Sequence Memory Test Ages 3-4 Form C v2.0
NIH Toolbox PSM 5-6 Form A	NIH Toolbox Picture Sequence Memory Test Ages 5-6 Form A v2.0
NIH Toolbox PSM 5-6 Form B	NIH Toolbox Picture Sequence Memory Test Ages 5-6 Form B v2.0
NIH Toolbox PSM 5-6 Form C	NIH Toolbox Picture Sequence Memory Test Ages 5-6 Form C v2.0
NIH Toolbox PSM 7 Form A	NIH Toolbox Picture Sequence Memory Test Age 7 Form A v2.0
NIH Toolbox PSM 7 Form B	NIH Toolbox Picture Sequence Memory Test Age 7 Form B v2.0
NIH Toolbox PSM 7 Form C	NIH Toolbox Picture Sequence Memory Test Age 7 Form C v2.0
NIH Toolbox PSM 8+ Form A	NIH Toolbox Picture Sequence Memory Test Age 8+ Form A v2.0
NIH Toolbox PSM 8+ Form B	NIH Toolbox Picture Sequence Memory Test Age 8+ Form B v2.0
NIH Toolbox PSM 8+ Form C	NIH Toolbox Picture Sequence Memory Test Age 8+ Form C v2.0
NIH Toolbox FL 3-7	NIH Toolbox Flanker Inhibitory Control and Attention Test Ages 3-7 v2.0
NIH Toolbox FL 8-11	NIH Toolbox Flanker Inhibitory Control and Attention Test Ages 8-11 v2.0
NIH Toolbox FL 12+	NIH Toolbox Flanker Inhibitory Control and Attention Test Age 12+ v2.0
NIH Toolbox DCCS 3-7	NIH Toolbox Dimensional Change Card Sort Test Ages 3-7 v2.0
NIH Toolbox DCCS 8-11	NIH Toolbox Dimensional Change Card Sort Test Ages 8-11 v2.0
NIH Toolbox DCCS 12+	NIH Toolbox Dimensional Change Card Sort Test Age 12+ v2.0
NIH Toolbox 4-Meter Walk Gait Speed Test 7+	NIH Toolbox 4-Meter Walk Gait Speed Test Age 7+ v2.0
NIH Toolbox 9-Hole Pegboard Dexterity Test 3+	NIH Toolbox 9-Hole Pegboard Dexterity Test Age 3+ v2.0
NIH Toolbox Grip Strength Test 3+	NIH Toolbox Grip Strength Test Age 3+ v2.0
NIH Toolbox Standing Balance Test 3-6	NIH Toolbox Standing Balance Test Ages 3-6 v2.0
NIH Toolbox Standing Balance Test 7+	NIH Toolbox Standing Balance Test Age 7+ v2.0
NIH Toolbox 2-Minute Walk Endurance Test 3+	NIH Toolbox 2-Minute Walk Endurance Test Age 3+ v2.0
NIH Toolbox Odor Identification Test 10+	NIH Toolbox Odor Identification Test Age 10+ v2.0

Title screen displayed in the app	Corresponding Instrument Name
NIH Toolbox Odor Identification Test 3-9	NIH Toolbox Odor Identification Test Ages 3-9 v2.0
NIH Toolbox Words-In-Noise Test 6+	NIH Toolbox Words-In-Noise Test Age 6+ v2.1
NIH Toolbox Regional Taste Test 12+	NIH Toolbox Regional Taste Intensity Test Age 12+ v2.0
NIH Toolbox Visual Acuity Test 3-7	NIH Toolbox Visual Acuity Test Ages 3-7 v2.0
NIH Toolbox Visual Acuity Test 8+	NIH Toolbox Visual Acuity Test Age 8+ v2.0
NIH Toolbox Dynamic Visual Acuity Test 3-7	NIH Toolbox Dynamic Visual Acuity Test Ages 3-7 v2.0
NIH Toolbox Dynamic Visual Acuity Test 8+	NIH Toolbox Dynamic Visual Acuity Test Age 8+ v2.0

Appendix 6 – NIH Toolbox 4-Meter Walk Gait Speed Test and 2-Minute Walk Endurance Test Walking Course

The NIH Toolbox Four-Meter Walk Gait Speed Test and Two-Minute Walk Endurance Test each use walking courses. The walking courses differ from each other but, if both measures are being administered, the courses can be laid out at the same time.

Equipment and materials needed:

- Tape measure with both feet and meter measurements
- Colored masking tape
- Two cones
- Chair

If administering the **Two-minute Walk Endurance Test**, you need an open space of at least 60 feet in length.

Following the schematic diagram attached, at 5 feet from the start, put a piece of tape 2' to 3' long across the hallway.

Put shorter pieces of tape at four 10-foot intervals from that piece of tape.

At the fifth 10-foot interval, put another piece of tape 2' to 3' long across the hallway.

If administering the **Four-Meter Walk Gait Speed Test**, you can superimpose the course on the course above or make another course.

Following the schematic diagram attached, at 5 feet from the start, put a piece of tape 2' to 3' long across the hallway.

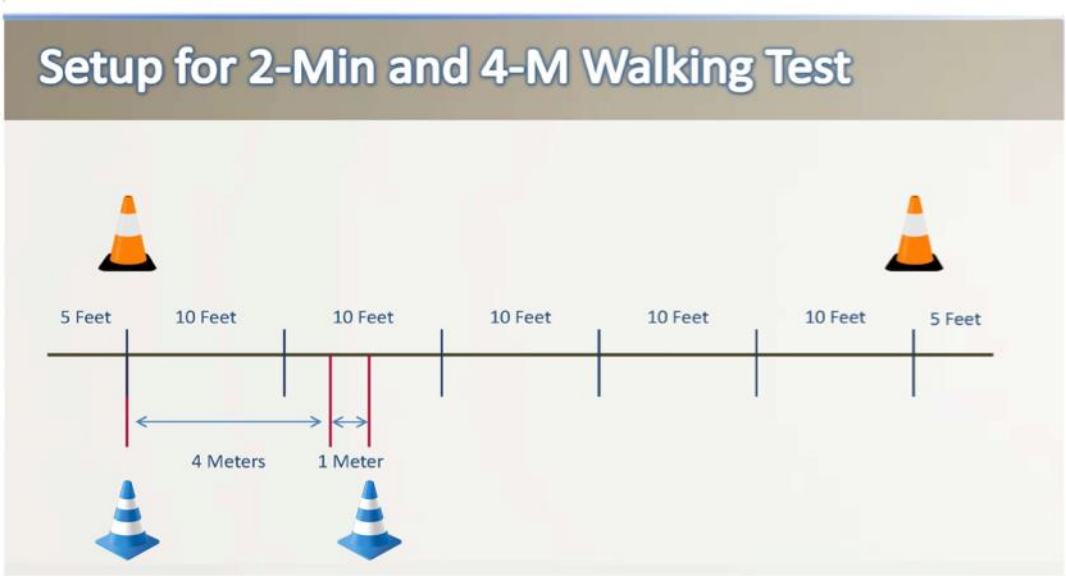
Measure 4 meters from the piece of tape, and put another piece of tape 2' to 3' long across the hallway.

Lastly, measure 1 meter from that piece of tape and put another piece of tape 2' to 3' long across the hallway.

For the **Two-minute Walk Endurance Test**, the cones should be placed at the sides of the first long mark and the last long mark of that course.

For the **Four-Meter Walk Gait Speed Test**, the cones should be placed at the side of the first long mark and the last long mark of that course.

For both measures, a chair should be placed near the beginning of the course.


Setup for 2-Min and 4-M Walking Test
5 Feet
10 Feet
10 Feet
10 Feet
10 Feet
10 Feet
5 Feet
4 Meters
1 Meter

Appendix 7 – NIH Toolbox Regional Taste Test Materials and Taste Solutions Mixing Instructions

Equipment and materials needed:

An electronic balance (scale) readable to at least 0.01 grams, and preferably 0.001 grams

Examples: Ohaus Aventurer Pro Series or Denver Instrument Summit Series prices run around $1000+

Magnetic stirrer

Example: Fisher Scientific Isotemp Basic Magnetic Stirrer 7 x 7 in, 120 volt price is $295

Stir bar (1 or 1.5 inches in length)

Example: Fisher Scientific Stir Bars 9.5 dia X 25.4 mm L price $7.79

Plastic-coated magnetic retrieving rod

Example: Fisher Brand Stir Bar Retriever, 12 inch price $16.27 each

A 1-liter graduated cylinder

Example: Fisherbrand Serialized Class A Graduated Cylinder price $169.42 each. A more affordable Polypropylene graduated cylinder is an option if cost is factor.

Solution storage bottles, light-occluding are required for quinine

Example: Pyrex Brown Solution Storage Bottles price for case of four 500 ml bottles is $173.65

A lab spoon

Example: Fisherbrand Lab Spoon price $13.93 each

Plastic weigh boats

Example: Anti-Static Weighing Boats price for small (needed for quinine) $39 for 500, price for large (needed for NaCl) $83.50 for 500

Food, Kosher or USP grade Quinine monohydrochloride dihydrate.

Example: Aldrich Quinine monohydrochloride dihydrate price: $58 for 100 grams.

USP grade NaCl

Example: Spectrum Sodium Chloride Granular, USP price: $174.70 per 2.5 kg. Can also be ordered in bulk.

Distilled or deionized water

Example: EartH2O Distilled Water available in grocery stores, prices vary by location

Note: NIH Toolbox norms were collected using USP grade NaCl (formula weight 58.44) available from Spectrum Chemicals and Kosher grade quinine monohydrochloride dihydrate (formula weight 396.9) available from Sigma-Aldrich.

Sterile cotton swabs

Distilled, deionized or other purified water for rinsing.

Example: Aquafiina. Dasani is NOT recommended because minerals are added back in after the purification.

Spittoon

iPad stand

Example: Belkin Portable Tablet Stage, price $97.99

Mixing instructions:

Make sure that balance is on a level surface. Add weigh boat to balance pan, and carefully zero the balance. Then add 58.44 grams of NaCl to the weigh boat. To mix the 1 Molar NaCl solution, you will need to add the NaCl to 1 liter of purified water. To do this, place pre-measured NaCl crystals in a 1-liter graduated cylinder. Make sure all the crystals are emptied from the weigh boat into the graduated cylinder. Slowly add distilled or deionized water to the 1-liter mark by bringing the meniscus (bottom) of the solution to the 1000 ml mark. Gently add the stir bar and then stir on a magnetic stirrer until the NaCl is completely dissolved (approximately 5 to 10 minutes). Once NaCl is fully dissolved, turn off the stirrer, and use the retrieving rod to remove the stir bar from the solution. Transfer the solution to labeled storage bottles. Wash and rinse graduated cylinder, stir bar, and retrieving rod thoroughly before reusing.

To mix 0.001 M quinine hydrochloride dihydrate, dissolve 0.397 grams quinine in purified water. To do this, weigh out 0.397 grams of quinine HCl dihydrate as described above. If you do not have access to an analytical balance that goes to four decimal points, weigh out 0.40 grams of quinine HCl on a standard top-loading electronic balance. Do not use a triple-beam balance for quinine. Place the pre-measured quinine in a 1-liter cylinder, add distilled or deionized water to the 1000 milliliter mark, gently add the stir bar and then stir on a magnetic stirrer until the quinine is completely dissolved, and no visible crystals can be seen (at least 15 to 20 minutes). Transfer the solution to labeled storage bottles. When finished, wash and rinse graduated cylinder, stir bar, and retrieving rod thoroughly before reusing.

Solution Storage Requirements:

Taste solutions should be made fresh each week, stored under refrigeration when not in use, and should be warmed to room temperature prior to use for testing. Please do not freeze the solutions because the container may crack (Note: 3-4 hours is generally required for solutions to warm to room temperature.)

Taste solutions should be stored in glass bottles with a non-reactive lid. Quinine is light sensitive, so quinine should be stored in a light-occluding glass bottle or a bottle wrapped in aluminum foil to minimize light exposure.

Use of Solutions for Taste Testing:

Each participant will be tested with 10 ml of quinine solution and 10 ml of NaCl solution. Solutions should be at room temperature for testing. Two labeled medicine cups should be

used to hold the solutions for testing each participant. 10 ml of quinine solution should be poured into one cup and 10 ml of NaCl solution should be poured into the second cup.

For tongue tip testing, a clean cotton swab will be dipped once in the quinine solution and then used to paint the solution across the anterior tongue.

After the participant rinses his/her mouth, a second clean cotton swab will be dipped once in the NaCl solution and used to paint the solution across the anterior tongue.

The solution remaining in each of the two cups will then be used for whole-mouth testing, first with quinine and then with NaCl.